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THE WIND INDUSTRY IN NAVARRE

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EXECUTIVE SUMMARY

An economic view to one of the pioneering regions in the world in the development of the wind industry, Navarre, located in the North of Spain from its inception in the 1990s to the present. Resultant of a combination of public policies, private and public investment and qualified employees. Throughout this essay, we will see in a time lapse of the main businesses of the region in terms of wind energy and how those have an impact in the economy of the region in terms of employment creation, direct and indirect; energy dependence; and investment.

KEY WORDS

Renewable energy, wind industry, wind energy, policy, investment, employment, environment, Navarre, EHN, Acciona Energía, EONA, Gamesa Eólica

TABLE OF CONTENTS

1. INTRODUCTION.....	5
2. MILESTONES OF THE WIND INDUSTRY IN NAVARRE.....	6
2.1. Brief insights of the wind industry in Navarre	7
2.1.1. Wind Power in Navarre, from 1995 to the present.....	7
2.1.2. Navarre's Wind Industry	11
3. FIRST STEPS INTO A WIND REGION	13
3.1. Legal Framework	13
3.2. Wind Companies.....	14
3.2.1. Energía Hidroeléctrica de Navarra (EHN) –later Acciona Eólica.....	14
3.2.2. Gamesa Eólica	22
3.2.3. Eólica Navarra (EONA)	25
3.2.4. Desarrollo de Energías Renovables SA (DERSA)	26
3.2.4. M.Torres	27
3.2.5. Ingeteam	30
3.2.6. Ecotècnia/Alstom/ General Electric.....	30
3.2.7. Inmetusa/Aertusa/NOI.....	32
3.3. Navarre, cradle of the Spanish renewables' research.....	33
3.3.1. CENER-CIEMAT	33
3.3.2. CENÍFER	36
4. CONCLUSION.....	37
REFERENCES.....	39
ANNEX.....	49

TABLE OF ILLUSTRATIONS

Figures

Figure 1. Navarre's Layout of Wind-Parks in 2004.....	7
Figure 2. Navarre's Layout of Wind-Parks in 2017.....	8
Figure 3. Wind Power vs. Total Electric Power 1998-2015 in Navarre	9
Figure 4. Wind Power Generation 1990-2015, Navarre vs. Spain.....	10
Figure 5. Wind Power vs. Total Electric Consumption 1995-2015 in Navarre.....	11
Figure 6. Wind Industrial Centers in Spain 2013	12
Figure 7. Meteorological Stations and Wind Areas in Navarre.....	15
Figure 8. Wind Map of Navarre.....	49
Figure 9. Layout of Gamesa Eólica Spanish plants in 2003	51
Figure 10. Layout of the Innovation's City in Sarriguren, 2003.....	51
Figure 11. Market Share of Wind Turbines 2008.....	52
Figure 12. DERSA's Wind Parks in 2005.....	52
Figure 13. Timeline of the Wind Industry in Navarre.....	53

Tables

Table 1. Wind Industrial Centers in Navarre 2013	12
Table 2. Navarre's Wind Firms 2002	50

1. INTRODUCTION

The use of wind as a source of energy is not a new issue, we have been using wind for the propulsion of boats, to pump water and for agriculture since the early recorded history. Nevertheless, it was during the 20th century when the windmills that generated electricity were developed.¹ The incipient awareness of the limitation of resources due to the exponential growth of the population, and the need for the introduction of a more sustainable and less expensive source of energy due to the petrol crises of the 70s, were the main reasons for the propulsion of renewable energies worldwide, with a special emphasis in wind energy.²

The regulations about renewable energy of the different governments worldwide across history played and are still playing an important part in the diverse development of these resources among countries and even regions. For instance, due to the objective 2020 of the European Union, Spain should manage to increase the consumption of renewable energy up to a 20% of the total energy consumed, which stimulates the industry.³

The beginnings of Spain in the wind industry started thanks to the system implemented in Navarre in 1994, extrapolated to other regions of Spain and other countries. The favorable treatment of Navarre with its Foral Tax Regime, which allows the region flexibility in certain political fiscal issues, helped in the introduction of advantageous laws in matters of wind industry before the rest of the State.

Despite the exceptionality of Navarre's wind power development, there has been no attempt to date to produce an historical account of the sector. Throughout this essay, we will study the special case of the wind industry in the region of Navarre from its beginnings in 1994 until the present. The aim of the paper is to give an economic view to the history of the sector in the region. The structure followed is first a brief description of the sector from the beginnings to the current situation in terms of wind power and businesses' generation (Section 2. Milestones of the Wind Industry in Navarre). The essay continues with the main body of the project, where the legal framework, the evolution of the main companies involved with the development of the sector and the investigation and education centers are

¹ Wind Energy Foundation. (n.d.). Retrieved from <http://windenergyfoundation.org/about-wind-energy/history/>

² Pintor Borobia, J. M., Lera López, F., García Ortega, J., & Faulín Fajardo, J. (2006). ENERGÍA EÓLICA Y EMPLEO: EL CASO DE NAVARRA COMO PARADIGMA.

³ European Commission. (n.d.). Renewable Energies. Retrieved from <https://ec.europa.eu/energy/en/topics/renewable-energy>

described one by one (Section 3. First Steps into a Wind Region). Finally, a personal reflection is offered in the last part of the project (Section 4. Conclusion).

2. MILESTONES OF THE WIND INDUSTRY IN NAVARRE⁴

1988 First Public Aid to Renewable Energies

1989 Creation of EHN (Energía Hidroeléctrica de Navarra)

1991-92 Meteorological stations of wind and sun

1994 Creation of Gamesa Eólica

1994 First wind park in “El Perdón” by EHN

1995 First Energy Plan of Navarre Horizon 2000, extended until 2005.

1995 Constitution of the company Aertusa in Tudela of wind blades

1997 The company Ingeteam develops an innovative technology for wind energy, IngecomW

1997-98 First wind park of EONA in Cabanillas (Ribera Baja)

1999 First wind park of DERSA in San Esteban

1999 WEP 1st program (Wind Energy Potential I, 1999-2003) of the EU leaded by Navarre

1999 Ecotècnia starts its activity in Buñuel

2000-02 CENER (Centro Nacional de Energías Renovables) starts its activity

2003-04 EHN, after being sold, turns into Acciona Energía

2003 CENÍFER (Centro Nacional Integrado de Formación en Energías Renovables)

2004 European prize to the best regional policy in the encouragement of renewable energies

2007 Second Energy Plan of Navarre Horizon 2010

2008 Inauguration of the Test Laboratory for Wind Turbines (LEA) property of CENER

2010 Navarre present in the trade fair “Wind Power” in Dallas and signs up an agreement with the state of Michigan for the jointly development of renewable energies

2011 Third Energy Plan of Navarre Horizon 2020.

⁴ Own elaboration with data from: Gobierno de Navarra. (2013). *Navarra, Energías Renovables, III Plan Energético Horizonte 2020* & Hemeroteca Diario de Navarra.

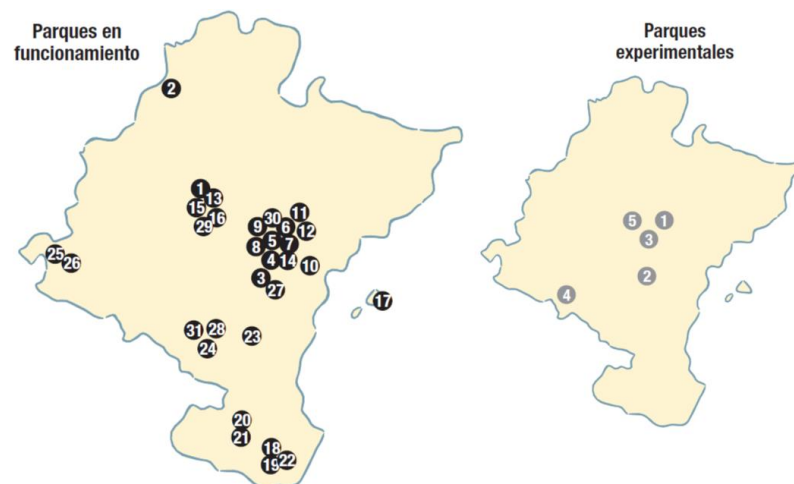
2.1. Brief insights of the wind industry in Navarre

Navarre has been a state-of-the-art wind region since 20th century, when in 1995 the first wind park was installed in El Perdón. The development of a wind industry, a sustainable sector with an in-depth technologic component, has been favorable not only for the environment and the energetic dependency of the region, but also for the diversification of Navarre, with a lower dependency of the automotive sector.

2.1.1. Wind Power in Navarre, from 1995 to the present

During the first ten years of the wind industry (1994-2004), 36 wind parks were installed, 5 of them experimental, for the companies to test their prototypes. The majority belonged to the company EHN, the semi-public firm that introduced the first wind park in El Perdón, more concretely 20 out of 31 were of EHN and it also had the co-property of 5 more. The remaining wind parks were property of EONA and DERNA, and the experimental ones of MTorres.⁵ In the following layout we can observe the distribution of the wind parks along the territory, most of them around the area Pamplona and middle Navarre.

Figure 1. Navarre's Layout of Wind-Parks in 2004



Source: *Diario de Navarra*⁶

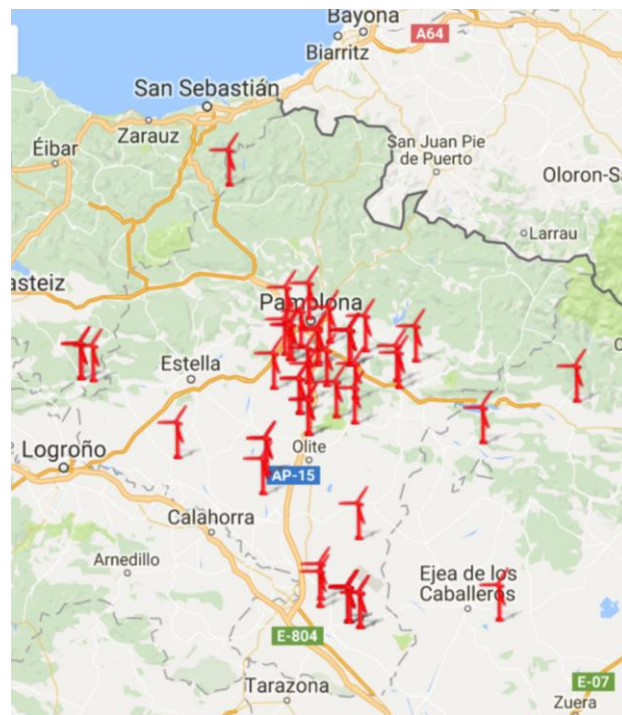
⁵ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. *Diario de Navarra*, p. 17.

⁶ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. *Diario de Navarra*, p. 17.

The boom of wind energy in Navarre slowed down from 2004 and forward years, in part due to the regulation. In 2004, the Government of Navarre closed down the wind map of the region with the Foral Statutory Order 634/2004. With this law, no more permissions for wind parks in the region were expedited, nevertheless it allowed the renovation of the existing parks to increase the wind power installed.

As we can see in the following layout of the wind parks of Navarre, not much was done since 2004. Currently, Navarre has 48 wind parks, but 13 are considered experimental having less than 4 windmills, therefore the wind map is similar to the one we had 10 years before. Out of the 48 wind parks, 23 are owned by Acciona Energía, the current EHN, 7 to DERSA, 5 to MTorres and the remaining to EONA.⁷

Figure 2. Navarre's Layout of Wind-Parks in 2017



Source: Asociación Eólica Empresarial (AEE)⁸

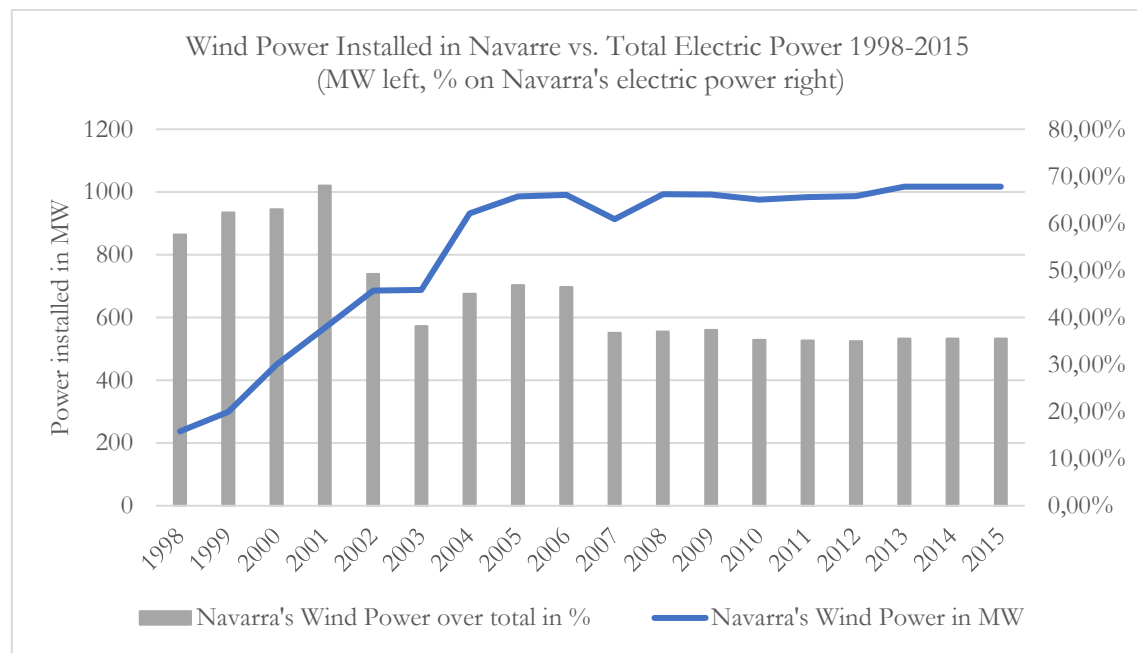
Regarding the wind power installed in Navarre, we can see in Figure 3 that from the period 1998 to 2005 it increased at an annual rate of 22.6%, from 237Mw to 986Mw in 7 years, more than 100Mw a year. Nonetheless, in 2015 the wind power installed in the region was of 1017Mw, only 81Mw more than ten years before, which reflects the stagnation of the sector, with an annual rate of growth of the 0.3%.

⁷ Asociación Eólica Empresarial. (2017). Mapa Parques Eólicos Navarra. Retrieved from <http://www.aecolica.org/es/map/navarra/>

⁸ Asociación Eólica Empresarial. (2017). Mapa Parques Eólicos Navarra. Retrieved from <http://www.aecolica.org/es/map/navarra/>

The wind power in Navarre represented the first years a significant part of the total electric power capacity installed the region, with its peak in 2001 where the 70% of Navarre's electric power capacity was wind energy. Since 2002 the share of wind power started to decrease in Navarre due in part to the appearance in 2002 of the other main source of electric power for the region, the gas combined cycle. In 2015, only the 35% of the total installed electric capacity belonged to wind energy resources, representing 1017Mw, competing with the 1222Mw of the combined cycle, which represented more than a 40% of the total's electric power installed in the region.⁹

Figure 3. Wind Power vs. Total Electric Power 1998-2015 in Navarre



Source: Own elaboration with data from *Diario de Navarra*¹⁰ and *Red Eléctrica de España*¹¹

In terms of energy generation, we can observe in Figure 4 that the wind energy generated in Navarre increased at a high speed the first ten years of the industry, from 1995 to 2005, going over from 13 to 2450 Mwh. Navarre was not the first region that introduced windmills, the first ones were installed in Galicia, Tarifa and Canarias. Nevertheless, as we can derive from the following graph, Navarre took the lead of Spanish wind production very soon.

Since the introduction of the first wind park in El Perdón in 1995 to the end of the 20th century the wind production of Navarre represented around a 30% of the total wind energy

⁹ Red Eléctrica de España. (2016, Diciembre 9). Indicadores Sistema Eléctrico CCAA. Retrieved from www.ree.es

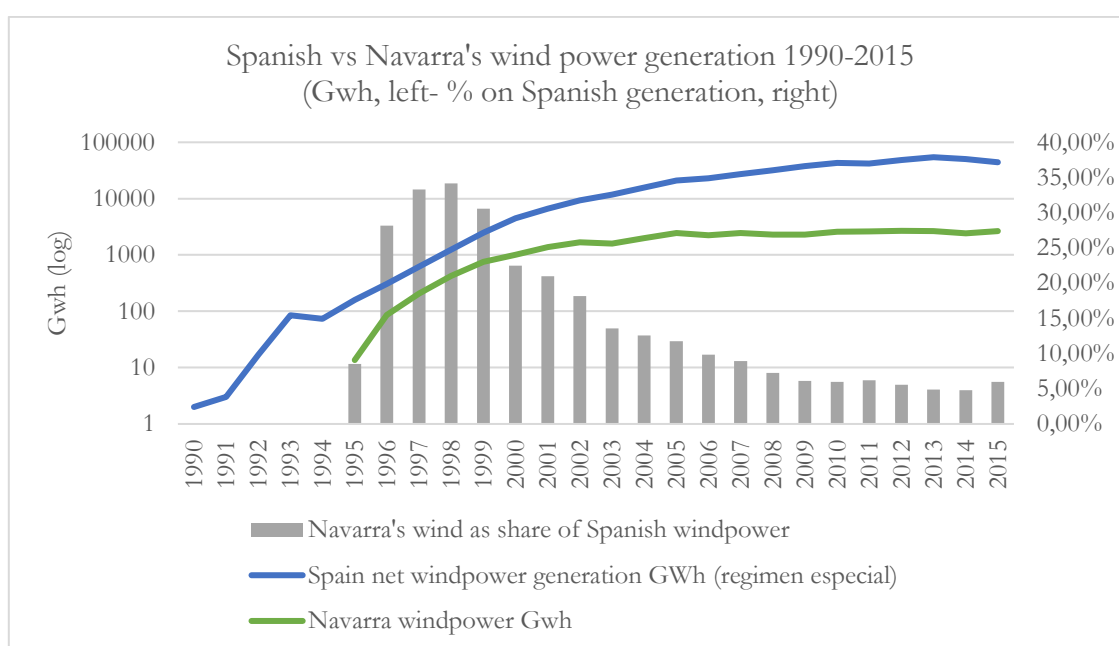
¹⁰ P.M. (2006, Diciembre 6). Navarra prevé aumentar su capacidad eólica un 50% sin añadir más molinos. *Diario de Navarra*, p. 17.

¹¹ Red Eléctrica de España. (2016, Diciembre 9). Indicadores Sistema Eléctrico CCAA. Retrieved from www.ree.es

produced in Spain, when the region only represents a 2% of the total surface of the country. The peak was in 1998, when 34% of the wind energy produced in Spain was generated in Navarre, a total of 422Gwh of the national 1237Gwh.

The wind power generation continued its expansion during the 21st century both in Navarre and Spain. The quantity of energy produced was significantly higher in 2015, with 2638Gwh for Navarre and 44183Gwh for the whole country, due to the technological advances of the industry and the increasing number of wind parks. Since the start of the 21st century, the share of Navarre's generation of wind power in Spain has become lower and lower, departing from a 31% in 1999 and arriving to a 6% in 2015.

Figure 4. Wind Power Generation 1990-2015, Navarre vs. Spain



Source: Own elaboration with data from Red Eléctrica de España (REE)¹² and Diario de Navarra¹³

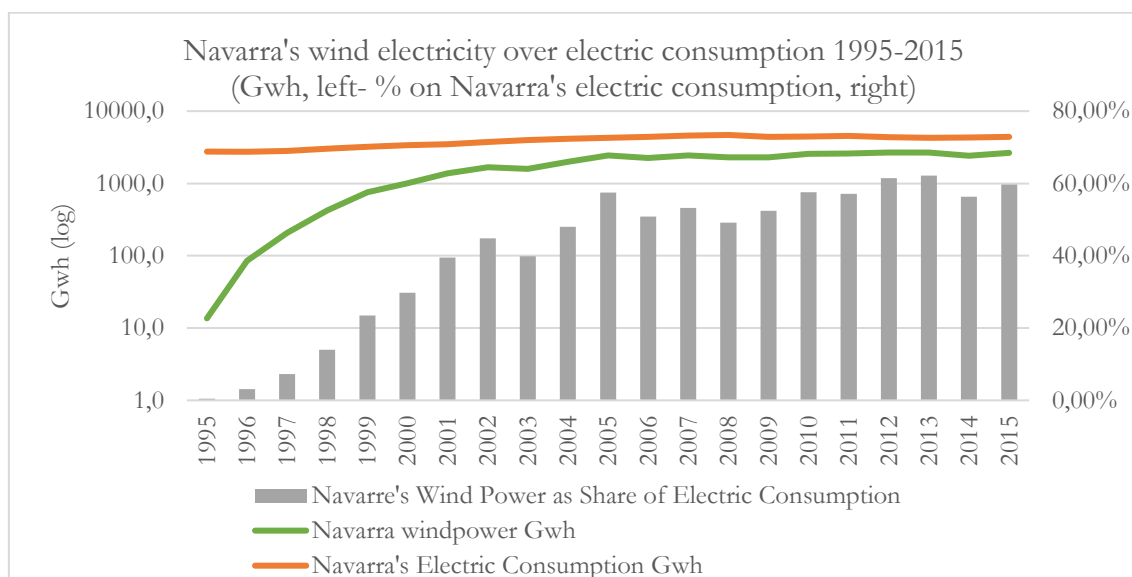
In terms of electric consumption, represented in Figure 5; the energy produced by the power of the wind accounted for almost a 59% of the total consumption of the region in 2015. Which jointly with hydraulic and solar energy, more than 70% of the energy consumed in Navarre came from renewable sources in 2015.¹⁴ As we can see in Figure 5, the wind power generated in the region accounts for more than a 50% of Navarre's electric consumption since 2005, reducing its dependency of other non-renewable resources and helping therefore to the environment.

¹² Red Eléctrica de España. (2016, Diciembre 9). Indicadores Sistema Eléctrico CCAA. Retrieved from www.ree.es

¹³ Vicondoa, M. L. (2001, Mayo 13). La Electricidad Despega en Navarra. Diario de Navarra, p. 4.

¹⁴ Gobierno de Navarra. (2017). Instituto de Estadística de Navarra, Sectores Económicos, Energía. Retrieved from <http://www.navarra.es/appsext/gn.institutoestadistica.web/InformacionEstadistica.aspx?R=1&E=5>

Figure 5. Wind Power vs. Total Electric Consumption 1995-2015 in Navarre



Source: Own elaboration with data from Instituto de Estadística de Navarra (IEN)¹⁵, Red Eléctrica de España (REE)¹⁶ and Diario de Navarra¹⁷

2.1.2, Navarre's Wind Industry

Navarre's wind industry helped to the diversification of the region into a sector with profound technical requirements and with vision of future. The first years were crucial for the development of the industry, from the last years of the 20th century, when the first steps were made, to the creation of 35 businesses¹⁸ that employed 1178 qualified people in 2002.¹⁹ The Government of Navarre, jointly with private investments propelled the creation of more than 4000 direct and indirect jobs and 40 new businesses in 10 years, from 1995 to 2005.²⁰

Since 2005 the industry slowed down, nonetheless Navarre's wind industry is still one of the most developed of the country competing with the Basque Country, Galicia and Madrid as we can observe in the following layout of the Spanish industrial wind centers in 2013. The region has industrial plants for the main wind activities along its territory as shown in the following table (assembly and logistics; wind turbines, motors and electric components; blades and control systems; wind towers and mechanical components; and maintenance) only lacking the industry of wind multipliers.

¹⁵ Gobierno de Navarra. (2017). Instituto de Estadística de Navarra, Sectores Económicos, Energía. Retrieved from <http://www.navarra.es/appsext/gn.institutoestadistica.web/InformacionEstadistica.aspx?R=1&E=5>

¹⁶ Red Eléctrica de España. (2016, Diciembre 9). Indicadores Sistema Eléctrico CCAA. Retrieved from www.ree.es

¹⁷ Vicondoa, M. L. (2001, Mayo 13). La Electricidad Despega en Navarra. Diario de Navarra, p. 4.

¹⁸ See Table 2. Navarre's Wind Firms, 2003 (Annex)

¹⁹ Pintor Borobia, J., García Ortega, J., Faulín Fajardo, J., & Lera López, F. (2002). Situación actual y prospectiva de futuro del sector de las energías renovables en Navarra.

²⁰ Gobierno de Navarra. (2005). INFORME – DIAGNÓSTICO DE LA COMUNIDAD FORAL DE NAVARRA.

Figure 6. Wind Industrial Centers in Spain 2013



Source: Asociación Eólica Empresarial (AEE)²¹

Table 1. Wind Industrial Centers in Navarre 2013

Wind Industrial Centers in Navarre 2013 ²²				
Identifier	Business	Activity	Classification	Municipality
▲ 2	Acciona Blades	Blades	Blades and Control Systems	Lumbier
■ 4	Acciona Wind Power	Production of Wind Turbines	Assembly and Logistics	Barasoain
■ 5	Acciona Wind Power	Production of Wind Turbines	Assembly and Logistics	Noaín
■ 15	Alstom	Assembly of Wind Turbines	Assembly and Logistics	Buñuel
▲ 34	Comantur SL	Maintenance	Blades and Control Systems	Carcar
▼ 48	Eldu	Electric Maintenance	Maintenance	Mutilva Baja
■ 60	Enflo Wintec Ibérica	Production of Wind Turbines	Assembly and Logistics	Orcoyen
★ 65	Fluitemnik	Production of Components	Wind Towers and Mechanical Components	Orcoyen
★ 66	Fluitemnik	Mechanic Shop	Wind Towers and Mechanical Components	Noaín
▲ 82	Gamesa	Blades' Cast	Blades and Control Systems	Inmarcoain
▲ 83	Gamesa	Blades	Blades and Control Systems	Aoiz
▲ 84	Gamesa	Blades	Blades and Control Systems	Tudela
★ 85	Gamesa	Production of Wind Towers	Wind Towers and Mechanical Components	Olazagutia
★ 93	Grupo Inerzia	Engineering and Production of Elevation Components	Wind Towers and Mechanical Components	Orcoyen
★ 94	Grupo Inerzia	Security and Protection Components for Jobs with Heights	Wind Towers and Mechanical Components	Mutilva Baja
▼ 95	Grupo Inerzia	Operating Services and Maintenance of Wind Parks	Maintenance	Orcoyen
● 107	Ingeteam Paneles, SA	Production of Electric Equipment	Wind Turbines, Motors and Electric Components	Sesma
▼ 121	M.Torres Olvega Industrial	Operating Services and Maintenance of Wind Parks	Maintenance	Artica
★ 153	Tesicnor, SL	Engineering and Production of Components	Wind Towers and Mechanical Components	Noaín

²¹ Asociación Eólica Empresarial. (2013). Eólica '13, Asociación Eólica Empresarial la Referencia del Sector.

²² Table of own elaboration with data from AEE

3. FIRST STEPS INTO A WIND REGION

The incipient and innovative beginning of the wind industry took place thanks to combination a favorable legal framework, resources, innovation, specific education and accurate decisions.

3.1. Legal Framework

Navarre has autonomy in certain political aspects due to its denomination of Foral Region, granting a competitive advantage for the region in certain issues. In this section, the political legislation applied in Navarre for wind energy is provided.

- ❖ 1988. Establishment of aids and fiscal deductions to investments in renewables by the Foral Statutory Order 222/1998
- ❖ 1990. First Action Plan of Energy (Government of Navarre) prioritizing renewable energies
- ❖ 1995. 1st Energetic Plan Horizon 2000, but extended until 2005. Main objective: to foster renewable energies in order to reduce the energetic dependence of the region.
- ❖ February 1996. Regulation for the installation of wind parks Order 125/1996.²³
- ❖ December 1996. Order 685/1996, no more adjudications for wind parks with higher power than 5Mw are allowed in order to avoid the saturation of parks and electric networks. The suspension for the construction of wind parks was in accordance with the energetic plan of Navarre of 1995 that did not contemplate the installation of more MW than the ones already requested from February to December 1996.
- ❖ 2003. Statutory Order 68/2003 for the regulation of experimental wind parks. The law established the following rules applied to experimental parks: only three parks for firm, with a maximum of four windmills in each park and for extendable three years.
- ❖ 2004. The wind map of Navarra was ‘closed’, with the Foral Statutory Order 634/2004, the Foral Government closed the door to the placement of new wind parks in the region, but at the same time made a way to the renovation of the existing windmills.

²³ Es objeto de este Decreto Foral la regulación de la implantación, en el territorio de la Comunidad Foral de Navarra, de las instalaciones para la obtención de energía mediante el viento, denominadas en lo sucesivo parques eólicos, con una potencia instalada superior a cinco megavatios, así como las condiciones urbanísticas y medioambientales para su implantación en el suelo no urbanizable (Gobierno de Navarra, 1996)

- ❖ 2005. Modification of the Statutory Order 68/2003 for the regulation of experimental wind parks. The modification extends up to 10 years the period of use for experimental wind parks.
- ❖ 2006. Foral Statutory Order 258/2006 by which additional norms for the administrative processing about the connection to the electric power of the special regime resources are described.
- ❖ 2007. 2nd Energetic Plan of Navarre Horizon 2010.
- ❖ 2011. 3rd Energetic Plan of Navarre Horizon 2020.

Who came first, wind businesses or wind laws? We will see along this report, how this legislation not only promoted, but also collapsed the development of the regional wind industry; and how the leading actors of the industry put pressure to the Government for the publication of a favorable regulation.

3.2. Wind Companies

In this section, a time-lapse about the main wind companies will be provided. Not only of the main generators of wind electricity (EHN, EONA, DERSA, DERNIA) but also of the principal industrial developers of parts of windmills from wind turbines (Gamesa Eólica, Ecotecnia, MTorres, Ingeteam) to wind blades (Aertusa, Gamesa Eólica) and to wind towers (Gamesa Eólica).

3.2.1. Energía Hidroeléctrica de Navarra (EHN) –later Acciona Eólica

In Navarre, the introduction of wind energy as a renewable source started with the semi-public company EHN (Energía Hidroeléctrica de Navarra) founded in 1989, currently named as Acciona Energía.

The semipublic company was launched by the Government of Navarre with the aim of diminishing the energetic dependence of the region considering that around the 94% of the energy consumed in the region was produced outside of it.²⁴ The objective was to reduce the energetic dependence with renewable resources, firstly with hydraulic energy (hydroelectric plants) and later with wind, solar and biomass energy,²⁵ with Esteban Morrás as General Director, one of the promoters of an alternative sustainable energetic plan for Navarre.²⁶

The initial capital investors were two public companies with a total of 48% of the capital: SODENA (Sociedad al Desarrollo de Navarra), an institution of the Government of Navarre

²⁴ M.A.R. (1989, Julio 21). Sodena, Iberduero, Portland y la CAN crean una empresa para la explotación de minicentrales hidráulicas en Navarra. Diario de Navarra, p. 19.

²⁵ Sociedad al Desarrollo de Navarra (SODENA). (n.d.). Casos de Éxito, EHN.

²⁶ Gaviria, M. (2016). Energía. (M. d. Rubio Varas, & J. de la Torre, Interviewers)

for public investments and development of the region, with a capital of 38% and CAN (Caja de Ahorros de Navarra), a bank foundation of the regional government, with a 10%. And two private companies with the remaining 52% of the capital: Proindesa, a capital investment company of Iberduero (current Iberdrola) with a 37% and Cementos Portland, a regional company that elaborated cement and was diversifying its portfolio in those years, with a 15%.²⁷

After some years in operation, EHN jointly with the regional Government studied the possibility of introducing wind energy as one of the areas of its core business. The study looked for the fulfillment of the three “Rs”.²⁸ The rule of the three “Rs” (Regulación, Red and Recursos); which consists in the verification of a favorable Administrative regulation for a viable industry not only technically but also economically; a prepared network for the distribution and transport of energy; and favorable resources (wind) for the industry to be profitable. After the positive analysis of 2 Rs (Red and Regulación), EHN installed in 1991 automatic meteorological stations across the region in order to measure the available resources of not only wind but also solar energy. In the following layouts, we can observe the location of the stations installed and the wind areas of the region:

Figure 7. Meteorological Stations and Wind Areas in Navarre



Source: Diario de Navarra^{29/30}

²⁷ M.A.R. (1989, Julio 21). Sodena, Iberduero, Portland y la CAN crean una empresa para la explotación de minicentrales hidráulicas en Navarra. Diario de Navarra, p. 19.

²⁸ Jimenez, J. R. (2014). El desarrollo de la industria eólica navarra. (F. MODERNA, Interviewer) Retrieved from <https://www.youtube.com/watch?v=p8nQ0SwYN-M>

²⁹ Riez, M. A. (1 de Mayo de 1994). Navarra eólica. Diario de Navarra, pág. 52.

³⁰ Rubio, J. (1993, Octubre 3). La búsqueda navarra de energías alternativas. Diario de Navarra, p. 46.

The results of the meteorological stations showed that the region had potential for the construction of wind parks. The experts said that in Navarre ‘the corner effect’ appears, with the mix of the winds of the east and west, which exalts the potential of the region in the topic of wind energy. They noticed that the region had areas of average annual wind speed higher than 6 meters/second at a height of ten meters, which is the threshold for a wind park to be profitable.³¹

Experts have divided the region into six wind areas: Cantabric, West, Pamplona, Pyrenees, Ribera Alta and Ribera Baja. In each area, we can find profitable points for the settlement of wind parks. For instance, in the Cantabric area the wind blows at average annual rates between 5 and 7.5 meters/second and in the West area the wind speed is moderate in summer and strong during winter, around 10 meters/second. Regarding the area of the Pyrenees we can distinguish between the mountains where the wind speed is usually high and the valleys where the speed is low. In the middle area (Pamplona) there are several points for the useful exploitation of wind as for the mountain chains of El Perdón and Leyre. As for the areas of the Ribera, we find moderate winds in Alta, and from moderate to strong winds in clear spaces in Baja.³²

The favorable results supported the idea of the introduction, little by little, of a wind industry in the region. The first step was in 1994, with the construction of the first wind park in El Perdón, a mountain range that borders Pamplona. The park was observable from the capital of the region and its visibility helped in the acceptance by the citizenship of the new and unknown, until the moment, source of energy, the wind.³³ The pilot park of El Perdón was built with the biggest and more updated wind turbines of the moment of 500Kw. The six windmills installed were able to produce 10 million of Kwh in a year, the equivalent to the consumption of the streetlight energy in Pamplona.³⁴ It was considered as a model park in Europe for its dimensions and wind turbines.

After the start-up of the pilot park of El Perdón in 1995, EHN developed an ambitious plan of production of wind parks jointly with the regional Government, who published in early

³¹ Riezu, M. A. (1 de Mayo de 1994). Navarra eólica. Diario de Navarra, pág. 52.

³² Rubio, J. (1993, Octubre 3). La búsqueda navarra de energías alternativas. Diario de Navarra, p. 46.

³³ Acciona Energía. (2014). Sala de Prensa, a fondo. Retrieved from <http://www.acciona.com/es/a-fondo/primer-parque-eolico-acciona-perdon-cumple-20-anos/>

³⁴ Riezu, M. A. (1 de Mayo de 1994). Navarra eólica. Diario de Navarra, pág. 52.

1996 the public allocation of wind parks in the region,³⁵ one year later. The aim was to have 200Mw of wind power by 2000, around the 10-12.5% of the energy consumed in the region.³⁶

In order to continue with the plan, EHN in alliance with the Government of Navarre had to define the new strategy that they wanted to follow. They had two alternatives, either buying all the advanced technology that wind parks require to the principal producers in Europe; or developing an industrial plan for the region trying to produce most of the technology needed. The option chosen was the creation of a wind industry in the region and for that they relied on the partnership with the company Gamesa Eólica.³⁷

After one week of being in operation, the wind park of El Perdón produced 300,000Kw with its six windmills. EHN in its aim of extrapolating the conditions of these wind park to the rest agreed in 1995 on the construction of three more places with 30 windmills each during the first stage of the parks. The position of the parks was the following: one located in the wind area of Pamplona, in the mountain chains of Guerinda (Leoz/San Martín de Unx); and the remaining two located in the Cantabric wind area, in the mountains of Aritz (Leitza) and Iruñarri (Ezcurra/Erasun). The company payed 200,000 pesetas for windmill to the city hall of each town in concept for the license of exploitation of the area for 75 years.³⁸

In 1997, EHN covered half of the wind energy power estimated for 2000 with 107Mw installed, and more wind parks were in construction. The major wind park in Europe until the moment was opened in November of this year, in the mountains of Guerinda, it included a new technology developed by the company Ingeteam in Navarre. The company invented a new system control, called IngecomW that allowed the blades to spin with different speed rates depending on the wind, which increased the electricity produced.³⁹

By the end of the year of the year, Navarre was considered one of the state-of-the-art regions in wind energy and it was able to reduce the dependence on energy because of its developments in the area. In 1998 Navarre's energetic dependence was of the 86%, reducing therefore in 8 percentage units the energy dependence in 1989, a percentage unit of reduction

³⁵ Gobierno de Navarra. (1996). Decreto Foral 125/1996.

³⁶ Diario de Navarra. (1994, Septiembre 22). No se debe marginar al norte de Navarra en los planes eólicos. Diario de Navarra, p. 29.

³⁷ Jimenez, J. R. (2014). El desarrollo de la industria eólica navarra. (F. MODERNA, Interviewer) Retrieved from <https://www.youtube.com/watch?v=p8nQ0SwYN-M>

³⁸ Fernández Larrea, F. (1995, Febrero 12). EHN proyecta instalar un parque eólico en los terrenos de Ezcurra y Erasun. Diario de Navarra, p. 28.

³⁹ Salvoch, I. (28 de Noviembre de 1997). EHN invertirá 6.000 millones en una central térmica que funciona con paja. Diario de Navarra, pág. 38.

a year. Out of the 14 percent of total energy produced in the region, 30% came from renewable sources, being 17.5% from the company EHN.⁴⁰

The very same year, the company signed up an internationalization plan that started with the license for the construction of the 35% of the wind energy considered in the French energetic plan with three wind parks of 22Mw in total. EHN settled the subsidiary Compagnie du Vent jointly with the French company Ingénierie German in order to accomplish this international expansion.⁴¹

One year later, in 1998, EHN started up the company Energías Eólicas Europeas S.A. jointly with Iberdrola, in its aim of expanding its activity to the rest of Spain.⁴² In addition, EHN settled another company jointly with DERSA, the second promoter of wind energy in Navarre, called DERNA. They collaborated in the construction of five wind parks in the middle part of the region.⁴³

The European program Ecos-Ouverture I (1999-2003) and its specific project for wind energy WEP (Wind Energy Potential) nominated Navarre as the leader for the study of the potential in terms of wind energy of the following regions: Cagliari (Sardinia, Italy), Spisska Nova (Spiss, Slovakia), Rimorska (Slovenia) and Vrancea (Romania). For that, Navarre had a budget of 877,000€, and the Government appointed the company EHN for this purpose.⁴⁴ In 1999, the company studied the implementation of wind parks in the region of Slovenia, expanding therefore its international activity⁴⁵ and one year later in Italy with the Italian company Erga, subsidiary of the Italian renewables company Enel.

The company was awarded in 2000 with two prizes, one of them international, the Prize Principe Felipe to the Business Excellence in the modality of Environmental Management⁴⁶ and the Financial Times Prize to the Best Renewables' Company.⁴⁷

⁴⁰ M.B., N. (1997, Diciembre 18). EHN Construirá en Cáseda una nueva minicentral hidroeléctrica. Diario de Navarra, p. 57.

⁴¹ Salvoch, I. (1997, Diciembre 6). EHN participa con 3.200 millones en el desarrollo eólico de Francia. Diario de Navarra, p. 25.

⁴² Salvoch, I. (1998, Junio 19). EHN invertirá 13.000 millones en parques eólicos en el resto de España durante 1999. Diario de Navarra, p. 31.

⁴³ Salvoch, I. (1998, Agosto 9). EHN y DERSA constituirán una nueva empresa para instalar cinco parques eólicos. Diario de Navarra, p. 25.

⁴⁴ S.E. (2002, Noviembre 16). Gobierno y EHN lideran un proyecto europeo para impulsar la energía eólica. Diario de Navarra, p. 33.

⁴⁵ DDN. (1999, Septiembre 21). EHN estudia implantar en Eslovenia parques eólicos con 200Mw de potencia. Diario de Navarra, p. 34.

⁴⁶ DDN. (2000, Abril 14). EHN obtiene el premio Príncipe Felipe de la excelencia empresarial. Diario de Navarra, p. 41.

⁴⁷ Salvoch, I. (2000, Diciembre 2). La empresa EHN recibió en Nueva York un premio empresarial de Financial Times. Diario de Navarra, p. 28.

By the beginning of the 21st century, the company had eleven wind parks in Navarre, which produced the 27% of the energy consumed in the region, reducing its energy dependence in 13% in only three years. Navarre was without doubt one of the mentor regions in the development of wind energy during the first years of the industry, producing the 4% of wind energy worldwide, mainly thanks to EHN;⁴⁸ and representing less than the 0,01% of the Earth's surface.⁴⁹

In addition, in its aim of improving the wind industry, EHN constructed in 2000 a research center for renewable energies in Tudela and it also collaborated with the Public University of Navarre (UPNA) in the creation of a renewable's chair.⁵⁰ One year later, the company signed up a contract with Cetenasa and Iberdrola with the same purpose, continue with the development of renewable sources of energy.⁵¹

In order to accomplish the expansion plan projected, EHN needed more sources of finance. The company negotiated jointly with Iberdrola the entrance to the stock market with a new partnership, but after several business talks, the plan was rejected in December 2001 due to a conflict of interests.⁵² Nonetheless, EHN aimed to enter into the stock market with an investment bank in 2003 but Iberdrola with a stock of 37% of the company rejected the plan, creating a conflict with the major Navarran shareholders of the company (Sodena, CAN, Cementos Portland) that were in favor of the company's expansion.⁵³ The conflict between Iberdrola and EHN lasted almost one year, which ended up with the distribution of the assets and the dismissal of Iberdrola as part of the shareholders' capital of EHN. The firm agreed to pay a compensation to Iberdrola of 130,9 million€ and the cession of the wind parks of Castilla la Mancha and Murcia. Maintaining therefore the wind parks of Navarre and Valencia.⁵⁴

⁴⁸ Diario de Navarra. (2000, Mayo 12). Tudela avanza en la investigación de las nuevas energías renovables . Diario de Navarra, p. 58.

⁴⁹ Central Intelligence Agency. (n.d.). The World FactBook. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2147rank.html>

⁵⁰ I.S. (2000, Septiembre 6). EHN aportará 40millones para crear una cátedra de renovables en la UPNA. Diario de Navarra, p. 29.

⁵¹ DDN. (2001, Mayo 9). Cetenasa, Iberdrola y EHN firman un acuerdo para desarrollar las energías renovables. Diario de Navarra, p. 40.

⁵² M.A.R. (2001, Diciembre 18). Exigencias de última hora de Iberdrola suspenden la firma del acuerdo con EHN. Diario de Navarra, p. 37.

⁵³ DDN. (2002, Marzo 27). Iberdrola se opone a la salida a bolsa de EHN que apoya el resto del capital. Diario de Navarra, p. 31.

⁵⁴ M.A.R. (2002, Noviembre 15). EHN e Iberdrola pactan su ruptura y se reparten su negocio de energía renovable. Diario de Navarra, p. 39.

In its aim of mend the stockholders' condition, EHN looked for new shareholders with the aid of the Citygroup business bank.⁵⁵ Several companies were interested in the acquisition of the 50% of EHN's capital corresponding to Iberdrola's and Cementos Portland's stocks. Finally, the Spanish company Acciona - at that time a family business in expansion mainly focused in the building sector - acquired in 2003 the stocks of EHN for €380 million.⁵⁶ A year later, in October 2004, Acciona obtained the remaining 50% of the shares in hands of the Government of Navarre, with Sodena and CAN, for €390 million. The company committed to maintain the location of the headquarters in Navarre, the employment and the investments planned by EHN.⁵⁷ Nonetheless, the decision of the Foral Government, leaded at that moment by Miguel Sanz (UPN), of selling out the shares of the company was very criticized not only by the other parties but also by the whole Navarran society.

In the middle of the controversy for the property of the company, EHN did not stop its expansion plan, and several regional, national and international actions were taken in those years of negotiation. According to Esteban Morrás, one of the founders of the company and promoter of the wind energy in the region, the mission of EHN was to be the leader multinational for the new sustainable energetic model.⁵⁸ In May 2003, the company opened the Barásoain's plant of wind turbines, which fought for a position in the market against the international firms General Electric and Vestas with its innovative technology regarding electricity generation. The Barásoain's plan, called Ingeniería de Turbinas Eólicas SA, owned in its totality by EHN, created in 2003 fifty direct job positions with a production capacity of 250 wind turbines a year.⁵⁹ In addition, EHN continued in 2004 its international expansion with the construction of a wind park in Australia, a country with a 90% of fossil fuel dependency ratio and with high growth expectations in the sector of renewable energy those days; along with the local firm Hydro Tasmania.⁶⁰

Another milestone for EHN, was the inauguration in 2005 of the first off-shore wind park in Ireland, promoted by EHN and the Irish firm Airtricity with the new society Zeusford, as one of the managers of the company for European issues, Arantza Ezpeleta, said, EHN was

⁵⁵ M.A.R. (2003, Abril 16). EHN busca nuevos accionistas para cubrir el hueco dejado por Iberdrola. *Diario de Navarra*, p. 33.

⁵⁶ Vicondoa, M. L. (2003, Agosto 1). Acciona y Sodena acuerdan alternarse cada dos años en la presidencia de EHN. *Diario de Navarra*, p. 22.

⁵⁷ DDN. (2004, Octubre 30). Sodena y Caja Navarra venden a Acciona el otro 50% de EHN por 390 millones de euros. *Diario de Navarra*, p. 19.

⁵⁸ Gonzalez, I. (2003, Enero 22). Navarra genera el 40% de la energía solar fotovoltaica que se produce en España. *Diario de Navarra*, p. 55.

⁵⁹ Santamaría, G. (2003, Mayo 7). La planta de turbinas eólicas de EHN en Berásoain competirá a nivel internacional. *Diario de Navarra*, p. 31.

⁶⁰ DDN. (2004, Marzo 4). EHN invierte 33 millones en un parque en Australia. *Diario de Navarra*, p. 31.

convinced about the future of wind energy in the sea, and this new off-shore wind park reflected this idea.⁶¹

EHN focused on its international and national expansion due to the political decision in 2004 by the Regional Government of closing the wind map of Navarra, with the Foral Statutory Order 634/2004, the order closed the door to the placement of new wind parks in the region, but it made way to the renovation of the existing windmills.⁶² At this moment, the company had promoted 25 wind parks in Navarra out of the 31 existents in the region, with a power of around 700Mw from a total of almost 900Mw for the region. Nevertheless, the renovation for the windmills of the company, was postponed in 2008 with the argument that from an economic and financial perspective the wind parks with windmills of 500 and 750Kw were working adequately for a few more years of use.⁶³

The name of EHN changed to Acciona Energía in October 2005, when all Acciona's assets for generation of energy were integrated under this name.⁶⁴ Acciona Energía was considered in 2006 as the worldwide leader in renewables and the third promoter of wind parks after Iberdrola and the American firm Florida Power Light. After EHN's acquisition in 2004, the firm located its headquarters in Sarriguren, Navarre, where 300 people were employed in 2006. In addition, the headquarters for the division of industrial wind power were in Navarre too, more concretely in Barásoain, where the plant of wind turbines with 128 employees in 2006 was located. Moreover, Acciona had Sometec, a business for repairing wind multipliers, and Green Energy, a business for the sale of the energy produced, with 12 and 18 employees respectively in 2006, Acciona Energía employed in Navarre, a total of 600 people in 2006, doubling the number of workers of EHN in 2003.⁶⁵

From its 19 employees of EHN in 1994 to the 2780 employees of Acciona Energía in 2015. From those a 45% are in the region of Navarre, a total of 1273.⁶⁶ What started as a hydroelectric firm in 1989 under the name EHN, has become into a well-known international firm of renewable energy, Acciona Energía, with a prosperous future, that enriches the region of Navarre.

⁶¹ DDN/Europa Press. (2005, Mayo 27). Inaugurado en Irlanda un parque eólico marino promovido al 50% por EHN. Diario de Navarra, p. 11.

⁶² Gobierno de Navarra. (2004, Agosto 9). Orden Foral 634/2004. Boletín Oficial de Navarra.

⁶³ P.M. (2008, Marzo 31). Una nueva empresa fusionará en junio el negocio renovable de Acciona y Endesa. Diario de Navarra, p. 27.

⁶⁴ P.M. (2006, Octubre 1). Navarra en el Terremoto Eléctrico. Diario de Navarra, p. 2.

⁶⁵ P.M. (2006, Octubre 1). Navarra en el Terremoto Eléctrico. Diario de Navarra, p. 2.

⁶⁶ DN. (2015, Enero 11). Veinte años de El Perdón, un parque eólico pionero. Diario de Navarra, pp. 26-27.

3.2.2. Gamesa Eólica

Gamesa Eólica is a company opened in May of 1994 in Navarre with the partnerships of Gamesa (Vitoria), as the main shareholder with the 51% of the capital; Vestas, a Danish company leader in the wind turbines' market, with a 40% of the capital; and SODENA, the financial instrument of the Government of Navarre, with the remaining 9%.⁶⁷ The firm arrived at the region driven by the ambitious plan of EHN and the Government of Navarre, which included as objectives not only the extraction of energy in an environmentally friendly way, but also the development of a wind industry in Navarre.⁶⁸

The firm constructed a plant in Pamplona, where the headquarters of the firm and the decision center are located, for the assembly of wind turbines and wind towers at its constitution in 1994, by which Gamesa Eólica supplied to EHN the windmills for its first wind park in El Perdón.

At the beginning of 1995 Gamesa Eólica and EHN signed up a supplying contract of wind turbines for 14,000 million pesetas in order to accomplish the wind plan of EHN of setting in motion 184 windmills by 2000 entirely produced in the region.⁶⁹ The contract generated 300 direct employment positions which according to Angel Luis Rodriguez San Vicente, CEO of the company EHN; *"it is an advantage for Navarre because for environmental issues this source of energy will be a future need, and it is going to create jobs and a new industry, and it will generate fiscal income as well which will help in the progress of the welfare state"*.

The chain of businesses continued in the region with the inauguration in 1995 of Apoyos Metálicos, the plant of Gamesa Eólica in Olazagutia for the construction of the towers. And in 1996, with the inauguration of Fiberblade, the plant of Gamesa Eólica in Alsasua for the construction of wind blades. This business chain generated 165 direct and 600 indirect job positions in mid-1996.⁷⁰ The volume of sales that the company managed with just a few years in operation was outstanding, Gamesa Eólica obtained a revenue of 1060 million pesetas in 1995, with the sale of 16 wind turbines; Apoyos Metálicos 1100 million pesetas in 1996 and Fiberblade 600 million pesetas in 1996 with the plant in operation only since August of the same year. They sold their products to not only Navarre but also to Galicia, the Basque

⁶⁷ Diario de Navarra. (1995, Octubre 8). El ex-vicepresidente Juan Ramón Jiménez, director de la firma Gamesa Eólica. Diario de Navarra, p. 31.

⁶⁸ DN. (1994, Octubre 7). Allí inauguró la empresa Gamesa Eólica. Diario de Navarra, p. 45.

⁶⁹ Salvoch, I. (1995, Febrero 4). La industria eólica creará 300 puestos de trabajo directos en Navarra. Diario de Navarra, p. 23.

⁷⁰ Morrás, P. (1996, Octubre 18). La industria eólica navarra prevé facturar 25.000 millones en 1997. Diario de Navarra, p. 38.

Country, Tarifa and Castilla-León, regions starting in the wind business.⁷¹ The total revenue of Gamesa Eólica in 1996 was of 8500 million pesetas, with a sale of 123 wind turbines and its installation in the wind parks, which accounted for the 74% of the total sales in the Spanish market for wind turbines.⁷²

In its aim for expansion, Gamesa Eólica encountered with national legal barriers, which were damaging Navarre's wind industry development. In fact, because of the protectionism applied by the provinces the free entrance of wind companies was restrained and it slowed down the development of the sector nationally. For instance, in Galicia the firm had open a plant in 1997 in order to participate in the wind plan of the region.⁷³ In spite of the legal problems, the firm was growing exponentially the during the first years, after three years since its commencements, the firm opened six plants, three of them in Navarre, two in Galicia and another one in Zaragoza, employing more than 350 people and with a sales revenue of 10800 million pesetas and a profit of 828 million pesetas in 1997.⁷⁴ The first international projects of the firm were in China and France.

EHN and Gamesa continued its good relationship in accordance with the expansion of both firms and in 2000 they signed a multimillionaire agreement for the supply of 600 wind turbines a year in the period 2000-2002 for a value of 100.000million pesetas. With this agreement, Navarre's economy was benefited.⁷⁵

The 31st October of 2000, the firm Gamesa entered the stock market which favored Gamesa Eólica in the projection of its image and knowledge about the brand. In 2000, Gamesa Eólica had more than a thousand employees in its ten plants along the Spanish territory, from which a 40% were from the three plants of Navarre.⁷⁶ Gamesa Eólica became an essential subsidiary of the group Gamesa, obtaining the 55.5% of the total revenue of the group in 2000.⁷⁷ In addition, the group was designed as the second world leader in the production of

⁷¹ Morrás, P. (1996, Octubre 18). La industria eólica navarra prevé facturar 25.000 millones en 1997. *Diario de Navarra*, p. 38.

⁷² DN. (1997, Junio 19). Gamesa Eólica. *Diario de Navarra*, p. 17.

⁷³ Salvoch, I. (1997, Octubre 17). El desarrollo eólico crea conflictos entre Navarra y varias autonomías. *Diario de Navarra*, p. 51.

⁷⁴ DN. (1998, Noviembre 7). Gamesa Eólica prepara el envío de doce molinos de viento a China. *Diario de Navarra*, p. 31.

⁷⁵ DDN. (2000, Enero 27). EHN comprará molinos a Gamesa Eólica por cien millones en tres años. *Diario de Navarra*, p. 26.

⁷⁶ Vicondoa, M. L. (2001, Febrero 11). Molinos con Pasaporte Internacional. *Diario de Navarra*, p. 11.

⁷⁷ DN/Europa Press. (2001, Febrero 28). Gamesa Eólica ganó 6.757 millones netos en el año 2000. *Diario de Navarra*, p. 32.

wind turbines in the report of 'World Market Update 2000' by BTM Consult Aps, with a 13.9% of the world's market and the leader in the Spanish market in 2000.⁷⁸

In 2001, in its objective of developing internally the technology of wind turbines and expand its international sales; the group Gamesa buys to Vestas, the Danish technological partner of Gamesa Eólica, the 40% that the firm had for €287 million. Gamesa Eólica in December 2001 was in hands of Gamesa with a 91% of the shares and of the Government of Navarre with SODENA, with the remaining 9%.⁷⁹ A few month later, in early 2002, SODENA sold to Gamesa the remaining 9% of the shares in Gamesa Eólica, becoming 100% of Gamesa for €64.5 million.⁸⁰ The new strategy followed by the firm created more jobs of high quality and high educational requirements in the region for the development of innovative technology in the center of R&D of Huarte (Navarre); in 2002 Gamesa Eólica had 600 employees in Navarre, a 50% of its total employees.⁸¹

The internationalization milestone of Navarre's subsidiary took place in 2002, when an agreement was reached with the Italian electric company Enel for the sale of 188Mw of wind power.⁸² In 2003, the firm had already assembled 31.35 Mw overseas, in China, USA and Italy; and it had more international agreements.⁸³ In order to attempt the expansion that the firm was heading, the widening of its plants was crucial, with 15 in the whole Spanish territory in 2003, as we can see in *Figure 9. Layout of Gamesa Eólica Spanish plants in 2003 (Annex)*.⁸⁴

The very same year, Gamesa's group bought the direct competitor of Gamesa Eólica in Spain, the company Made, until the moment property of Endesa.⁸⁵ The group was specializing towards wind energy and renewables, not only with the purchase of Made and the subsidiary Gamesa Eólica, but also with the creation of the subsidiary for the exploitation of renewable energy Gamesa Energía, leaving the aeronautic business in a second place. In

⁷⁸ DDN. (2001, Abril 6). Un informe sitúa a Gamesa como segundo fabricante mundial de aerogeneradores. Diario de Navarra, p. 38.

⁷⁹ Vicondoa, M. L. (2001, Diciembre 4). Diario de Navarra. El grupo Gamesa compra a Vestas el 40% que tenía en Gamesa Eólica, p. 34.

⁸⁰ DDN. (2002, Febrero 2). Sodena cobrará en efectivo 64,5 millones de euros por la venta del 9% de Gamesa Eólica. Diario de Navarra, p. 30.

⁸¹ DDN. (2002, Agosto 2). Gamesa Eólica ganó más de 20 millones de euros en el primer semestre. Diario de Navarra, p. 25.

⁸² Estévez, M. A. (2003, Febrero 18). Gamesa Eólica aumentó sus beneficios un 118% en 2002. Diario de Navarra, p. 37.

⁸³ DDN. (2003, Septiembre 19). Gamesa Eólica instalará sus aerogeneradores en dos parques chinos y uno luso. Diario de Navarra, p. 27.

⁸⁴ Vicondoa, M. L. (2003, Septiembre 28). Gamesa Eólica busca fuera el viento. Diario de Navarra, pp. 2-3.

⁸⁵ DDN. (2004, Junio 1). Gamesa prevé facturar 1.992 millones de euros en 2004, un 24% más que el año pasado. Diario de Navarra, p. 35.

fact, in 2004, Gamesa Eólica was the second world leader in the sale of wind turbines with a market share of 18% and more than 1500Mw sold.⁸⁶

In 2005, Gamesa Eólica bought the facilities of NOI, a blades plant in Tudela Navarre for the construction of a logistics center and a blades plant, named Coenasa (Componentes Eólicos de Navarra SA) with an investment of €19million.⁸⁷

The group continued its expansion towards the wind sector and in 2016 all wind assets were integrated with Siemens' wind assets after the sale of the 59% of the shares of the group to Siemens. The corporate headquarter of the new consolidated group is located in the Basque Country whereas the technologic headquarter remains in Navarre, where the group employs more 1200 people.⁸⁸

3.2.3. Eólica Navarra (EONA)

Eólica Navarra SL, a wind company constituted in 1995 by the Oliver siblings, owners of Grupo Enhol, in Buñuel (Navarre), for the construction and exploitation of wind parks in the region.⁸⁹ The Oliver siblings, entered in the wind sector in their aim for diversifying the business that their grandfather started back in 1930, for the cultivation of seeds.⁹⁰ After EHN, EONA was the second company for the exploitation of wind energy in the region. Its first wind park was constructed in Cabanillas in 1997 and inaugurated a year later. It was promoted at 50% with Elecnor, with 50 windmills of 600Kw each and with an investment of 3900 million pesetas.⁹¹ The wind power installed was of 30Mw with the technology of the Catalanian firm Ecotècnia.⁹²

In 1999, the company started its second wind park in Tudela, Montes de Cierzo, with wind blades from the Tudela's company Aertusa, and wind turbines from Econtècnia, that was constructing its plant in Buñuel⁹³. EONA stimulated with its activity the wind industry in La

⁸⁶ DDN. (2005, Noviembre 25). Creciendo con el viento. Diario de Navarra, p. 74.

⁸⁷ Vicondoa, M. L. (2005, Septiembre 17). Gamesa anuncia una inversión de 19 millones en renovables en La Ribera. Diario de Navarra, p. 37.

⁸⁸ cumple-20-anos/

Álvarez, M. (2017, Marzo 14). La UE no pone condiciones a la toma de control de Siemens en Gamesa. Diario de Navarra, p. 11.

⁸⁹ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. Diario de Navarra, p. 17.

⁹⁰ DN. (2003, Enero 29). Premiada la iniciativa empresarial de los cuatro hermanos Oliver de Buñuel. Diario de Navarra, pp. 32-33.

⁹¹ Calvo, N. (1998, Septiembre 23). La energía eólica llega a la Ribera con los dos parques de Cabanillas. Diario de Navarra, p. 46.

⁹² DDN. (1999, Mayo 9). La empresa eólica Ecotècnia, con un parque navarro, se integra en MCC. Diario de Navarra, p. 63.

⁹³ Vicondoa, M. L. (1999, Mayo 27). Aertusa invertirá 700millones y creará 80 empleos para ampliar su producción eólica. Diario de Navarra, p. 43.

Ribera, with the generation of wind parks with technology made in Navarre.⁹⁴ The group founded different subsidiaries for the construction of its wind parks in Navarre, calling them Eólica followed by the name of the park, as for Eólica Cabanillas SL, Eólica Montes de Cierzo, Eólica La Bandera, Eólica Caparroso. In 2004, the company had 220MW distributed along the region in 6 parks.⁹⁵ The wind business of the group was also expanded to Spain along with Gamesa as their national partner, placing wind parks in Soria and Huesca.⁹⁶

In 2004, the Oliver siblings started the internationalization process of the wind section of their group. The group bought the 22% of the actions of FERSA, a Catalanian firm of renewables that was listed in the stock exchange market with shareholders Catalana Occidente, in order to face the internationalization process. As return for the shares, Fersa and Grupo Enhol integrated international wind projects in India and Polonia for value of €131 million.⁹⁷

Nowadays, Latin-America is the strategic region where the group is focusing on, with wind parks as El Porvenir in Mexico, inaugurated in 2014.⁹⁸ Nevertheless, the group never forgets its origins, and Tudela in La Ribera is the place where the headquarters are located.⁹⁹ A family agricultural business which started in 1930, has turned into a small multinational whose core business is 'Renewables'.

3.2.4. Desarrollo de Energías Renovables SA (DERSA)

Desarrollo de Energías Renovables SA (DERSA), a society constituted in 1996 with the goal of exploit, produce and promote energy. The initial shareholders were the following four, with a 25% of the shares each: Caja Rural de Navarra with its subsidiary Estable Total SL; Tegui Electrónica SA, devoted to the production and commercialization of automatic entry phones; Manufacturas Metálicas JEVIT SA, dedicated to the production and commercialization of office furniture; and Malkaitz SA, a subsidiary of Agropecuaria Navarra Sociedad Cooperativa in its 95%, and Caja Rural de Navarra in the remaining 5%, and whose activity relies on the primary sector.¹⁰⁰

⁹⁴ Diario de Navarra. (2000, Mayo 12). Tudela avanza en la investigación de las nuevas energías renovables . Diario de Navarra, p. 58.

⁹⁵ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. Diario de Navarra, p. 17.

⁹⁶ DN. (2003, Enero 29). Premiada la iniciativa empresarial de los cuatro hermanos Oliver de Buñuel. Diario de Navarra, pp. 32-33.

⁹⁷ P.M. (2007, Octubre 23). Los Oliver se harán con el 22% de Fersa, al integrar proyectos eólicos que valen 131 millones. Diario de Navarra, p. 21.

⁹⁸ Grupo Enhol. (n.d.). Retrieved from <http://www.grupoenhol.es/>

⁹⁹ DN.(2009,Noviembre 6). El Grupo Enhol apuesta por la tecnología y la innovación.Diario de Navarra,p. 53.

¹⁰⁰ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. Diario de Navarra, p. 17.

The firm started in the wind sector with a project outside the region, more concretely with the construction of a wind park in La Muela, Zaragoza, towards the collaboration with company Sistemas Energéticos La Muela. In 1996, DERSA submitted a plan to the Foral Government for the construction of eleven wind parks in the region, and in 1997 the regional Government approved five of them in the municipalities of San Esteban in 1999, Caluengo in 2001, Uzquita in 2004, Altos de Cirauqui and Monte Eskinza, all of them in the Navarra Media, investing more than 14.000 million pesetas in the area in the installation of 100Mw.¹⁰¹

Even though the five parks were assigned to DERSA, the firm decided to create a subsidiary jointly with EHN, called DERNA, Desarrollo de Energías Renovables Navarra; with the purpose of bringing together the expertise and knowledge in the field.¹⁰²

DERSA expanded its operations in the wind sector along the Spanish territory with the construction of wind parks by different subsidiaries in La Rioja, Aragón, Castilla y León, Castilla La Mancha and Cantabria, as we can see in Figure 12 (Annex).¹⁰³

The firm was sold in 2005 to Gas Natural for €278 million, which in that moment was in 50% of Caja Rural de Navarra, with an agreement of maintaining the social dominance in the region, where 16 employees worked in the headquarters of the firm.¹⁰⁴ DERSA became in 2005 the second Navarre's firm for the exploitation of wind energy, after EHN with Acciona, that is sold to a national energetic operator.

3.2.4. *M.Torres*

Founded in 1975 in Torres de Elorz, Navarre; Manuel Torres is a firm whose main activity at the beginning was the development and production of machinery for the sectors of aeronautics and paper. In 1999, the firm started its diversification by the production of wind turbines located in experimental wind parks in Navarre.¹⁰⁵ The wind activity of M.Torres started with the development of a synchronous wind turbine multipole of 1500Kw and with carbon fiber blades.¹⁰⁶ The innovative technology of multipoles allowed the extraction of energy with better quality, the prevention of failures in the system due to the malfunction of

¹⁰¹ Salvoch, I. (1997, Septiembre 16). Una nueva empresa eólica invertirá 14000 millones en la Zona Media. Diario de Navarra, p. 72.

¹⁰² Salvoch, I. (1998, Agosto 9). EHN y DERSA constituirán una nueva empresa para instalar cinco parques eólicos. Diario de Navarra, p. 25.

¹⁰³ P.M./Agencias. (2005, Abril 21). Gas Natural compra la empresa eólica Gas Natural compra la empresa eólica. Diario de Navarra, p. 36.

¹⁰⁴ P.M./Agencias. (2005, Abril 21). Gas Natural compra la empresa eólica Gas Natural compra la empresa eólica. Diario de Navarra, p. 36.

¹⁰⁵ Vicondoa, M. L. (2002, Abril 24). M.Torres finaliza la fabricación de dos máquinas herramientas para el Airbus 380. Diario de Navarra, p. 30.

¹⁰⁶ Medina, M. (2002, Octubre 22). Olite y Unzué contarán con sendas áreas eólicas experimentales en el próximo año. Diario de Navarra, p. 59.

the electric power, the resistance of a higher wind speed, the reduction of the maintenance costs and it also had a lower impact on the environment according to Mario García Sanz, business consultant of MTorres and professor in the Public University of Navarre, technology only used by another competitor internationally, the German firm Enercom.¹⁰⁷ In order to construct the wind turbines, the firm opened a plant outside of the region in Ólvega (Soria). Nonetheless the research and development team remained in the Navarran headquarters of Torres de Elorz.

MTorres constructed six experimental parks in Navarre. The first one in 2001 in Cabanillas, a town in the South of the region, La Ribera; with a windmill of 1500Kw. In 2003, the firm opened the second experimental park in Unzúe, with first two windmills of 1500Kw, that was expanded with another one.¹⁰⁸ In 2004, windmills of 1650Kw were incorporated to the wind parks of MTorres in Olite and Pueyo, including three each. Before the Navarran closure of wind map of Navarra in 2004 with the Foral Statutory Order 634/2004, the firm agreed with the Government the construction of two additional experimental parks in Lodosa and Enériz, with a power of 4.95 Kw each.¹⁰⁹

The profits obtained with the energy produced in the experimental parks were reinvested in the forward development of the wind turbines. This task was carried out by the employees that integrated the R&D team of the firm, which in 2004 was made up of twenty people.¹¹⁰

MTorres did not agree with the favorable situation given to the firm EHN in the field of wind energy, and denounced the situation to the European Competence in 2003. MTorres was against the favorable and 'not-transparent' adjudication of wind parks to the semi-public company EHN after the first statutory order 125/1996, that was restricted ten months later for wind parks of more than 5Mw with the order 685/1996.¹¹¹ They also charged their disconformity with the restrictive law that regulated experimental wind parks since 2003, allowing only three parks for firm, 4 windmills maximum in each park and for an extendable

¹⁰⁷ Vicondoa, M. L. (2003, Septiembre 17). MTorres prevé invertir durante los dos próximos años nueve millones en eólica. *Diario de Navarra*, p. 27.

¹⁰⁸ Vicondoa, M. L. (2003, Septiembre 17). MTorres prevé invertir durante los dos próximos años nueve millones en eólica. *Diario de Navarra*, p. 27.

¹⁰⁹ DDN. (2004, Diciembre 26). Diez Años de Molinos de Viento en Navarra. *Diario de Navarra*, p. 17.

¹¹⁰ Vicondoa, M. L. (2004, Febrero 8). MTorres abrirá una planta eólica en Soria con una sociedad pública de Castilla y León. *Diario de Navarra*, p. 32.

¹¹¹ por 390 millones de euros. *Diario de Navarra*, p. 19.

DDN. (2005, Marzo 2). DENUNCIA DE MTORRES SOBRE LA NORMATIVA EÓLICA EN NAVARRA. *Diario de Navarra*, pp. 26-27.

duration of 3 years. The main controversy resided in the scarce period for the trial of the technology, that in 2005 was extended up to 10 years.¹¹²

In 2006, the firm was awarded with the prize Príncipe Felipe to the technological innovation. At the moment the firm was developing the machinery for an Airbus A-380 and the wind desalination plant. Manuel Torres declared that the prize was the acknowledgment of their effort and dedication, and he emphasized that their main milestone was the introduction of carbon fiber as a substitute to the fiberglass in their products, a pioneering innovation.¹¹³

The firms expansion in the innovation of wind energy arrived with several bilateral agreements, national and internationally. In 2008, the firm created a subsidiary called Ólvega Industrial, MTOI; with an Egyptian firm, El Sewdy, with the 30% of the shares; to continue the development of innovative wind turbines.¹¹⁴ In 2009, Gamesa and Mtorres agreed in a project for the development of a new concept of wind blades and its automatized production process.¹¹⁵ In 2010, an agreement was reached with the Libian Government for the construction of 60Mw in the country, but it was paralyzed after the revolution, leaving MTOI in a dangerous situation with an excessive stock.¹¹⁶

After the problematic situation of Libia, MTorres decided to leave MTOI in hands of the Egyptian partner El Sewedy selling the remaining shares in 2013. This leaves to MTorres only the exploitation of the 8 experimental wind parks of the region that are in hands of MTorres Desarrollo Energético (MTDE), with a total power of 35 Mw. The parks are located in Unzué, Olite, Pueyo, Lodosa, Enériz, Artajona and Tafalla. The division for Wind Energy of MTorres, MTDE, had 10 employees in 2013.¹¹⁷

MTorres a firm that started its diversification with the entrance in the wind sector in 1999 with the development of wind turbines and blades, was reduced 15 years later to the exploitation of a few experimental parks. The wind sector never got off the ground for MTorres, which main profits came from the aeronautic sector.

¹¹² P.M. (2005, Abril 26). Nuevas condiciones para instalar parques eólicos experimentales. Diario de Navarra, p. 30.

¹¹³ B.A.H. (2007, Marzo 30). La empresa MTorres logra el premio Príncipe Felipe a la innovación tecnológica. Diario de Navarra, p. 29.

¹¹⁴ Vocondoa, M. L. (2008, Octubre 22). MTorres se alía con un socio egipcio para el desarrollo de nuevos aerogeneradores. Diario de Navarra, p. 24.

¹¹⁵ Estévez, M. A. (2009, Febrero 27). Gamesa contrata por 100 millones a MTorres nueva tecnología para fabricar palas. Diario de Navarra, p. 23.

¹¹⁶ Vocondoa, M. L. (2013, Octubre 21). MTOI deja de pertenecer a MTorres y pasa a ser del egipcio Elsewedy. Diario de Navarra, pp. 22-23.

¹¹⁷ Vocondoa, M. L. (2013, Octubre 21). MTOI deja de pertenecer a MTorres y pasa a ser del egipcio Elsewedy. Diario de Navarra, pp. 22-23.

3.2.5. *Ingeteam*

The group Ingelectric Team, devoted to the design and production of products for energy solutions, the iron and steel industry for the propulsion of trains and boats and automatized systems; belongs to three main blocks of shareholders, with 60% four affluent families of Bilbao, KutxaBank with 30% and with the remaining 10% the executive managers.¹¹⁸

The company started in Navarre in July of 1990, with a subsidiary located in Pamplona, Ingeteam Electric. In its beginnings, the company was devoted to the control and automatization of hydroelectric power plants, mainly of EHN. But in 1996, one year after the installation of the first wind park prototype in Navarre, concretely in El Perdón, the company designed the first electric converters for EHN.¹¹⁹ A milestone not only for the company but also for the wind industry of the region was the innovation in 1997 of a new control system called IngecomW that allowed the blades to spin at variable speed rates depending on the wind, which increased the electricity produced.¹²⁰

Ingeteam started to sell this innovative technology also to international producers of wind turbines as for Gamesa and Mitsubishi, becoming well-known in the wind industry. In order to achieve its demand requirements, the Sesma's factory for the production of the designed systems was opened the very same year. And in 2000, the plant was diversified to the introduction in the benchmark of solar energy.

A company, that started to attend the regional demand of renewable energy in Navarre, has become into an international referent in renewable techniques with presence in twenty countries. The presence in Navarre is still very important, employing 450 people in 2015 between the plants of Sesma and Sarigurren.¹²¹

3.2.6. *Ecotècnia/ Alstom/ General Electric*

Ecotecnia, originally a Catalanian firm of engineers that started its activity in the renewables sector in 1981. The firm focused in the development and production of wind turbines for their clients, competing with international developers as Vestas. Their wind turbines were

¹¹⁸ Vicondoa, M. L. (2015, Diciembre 6). Ingeteam cumple 25 años impulsada por los mercados internacionales. *Diario de Navarra*, pp. 24-25.

¹¹⁹ Vicondoa, M. L. (2015, Diciembre 6). Ingeteam cumple 25 años impulsada por los mercados internacionales. *Diario de Navarra*, pp. 24-25.

¹²⁰ Salvoch, I. (28 de Noviembre de 1997). EHN invertirá 6.000 millones en una central térmica que funciona con paja. *Diario de Navarra*, pág. 38.

¹²¹ Vicondoa, M. L. (2015, Diciembre 6). Ingeteam cumple 25 años impulsada por los mercados internacionales. *Diario de Navarra*, pp. 24-25.

the first ones installed in Spain, more concretely in 1992 with the wind park of Tarifa, exploited by the Spanish company MADE.¹²²

The activity of Ecotècnia in Navarre started with the construction of the wind park of Cabanillas promoted by the firm EONA in 1998. In 1999, the firm integrated its activity with the Basque Group Mondragón, MCC, in order to obtain synergies.¹²³

The great leap forward of Ecotècnia in the region took place in 2000, when the plant for the assembly of wind turbines opened in Buñuel, creating 50 job positions. With an agreement with the Tudela's plant of wind blades and towers, they supplied the windmills to wind promoter EONA for its parks along the region.¹²⁴ In 2000, the parks operated by EONA with technology of Ecotècnia were four located in La Ribera, more concretely in Cabanillas, Tudela (Montes de Cierzo), Fustiñana (La Bandera) and Caparroso, with a total of more than 200 windmills.¹²⁵

Ecotècnia was positioned in 2001 as the 6th supplier of wind turbines in Spain, with a share of the 5.5%, behind the Navarra's firms Gamesa with a 36.6% and Acciona with a 10.5%, and the international firms Vestas with a 24.5%, Suzlon with an 8.8% and Enercon with a 6.2% (*See Figure 11. Market Share of Wind Turbines 2008, Annex*). It also had an important presence in the world's market, with at least 1% of the market share.¹²⁶

In 2007, the Catalanian firm was sold to the French company of trains Alstom for €350 million, in its aim of diversifying the portfolio towards the new sector in development all over the world. Ecotècnia had in 2007, including the plant in Buñuel with a hundred employees, four more plants in Spain, in Zamora, Somozas, Río de Pozo and Pla de Santa María.¹²⁷ After its adjusting plan for the wind sector in Spain due to the scarce national demand, Alstom closed own the plants of Somozas and Zamora, but it maintained the plant with all employees in Buñuel.¹²⁸

¹²² Carrasco, R. (1994, Noviembre 14). La tecnología española domina el ranking europeo en calidad. *Diario de Navarra*, p. 16.

¹²³ DDN. (1999, Mayo 9). La empresa eólica Ecotècnia, con un parque navarro, se integra en MCC. *Diario de Navarra*, p. 63.

¹²⁴ González, I. (2000, Junio 1). La comarca Ribera se sitúa a la cabeza en la producción de energías renovables. *Diario de Navarra*, p. 58.

¹²⁵ González, I. (2000, Agosto 24). El parque eólico La Bandera de Fustiñana se pondrá en marcha a finales de octubre. *Diario de Navarra*, p. 36.

¹²⁶ Salvoch, Í. (2009, Julio 7). Tres empresas navarras implantaron el 16% de la potencia eólica mundial en 2008. *Diario de Navarra*, p. 14.

¹²⁷ Europa Press. (2007, Junio 27). Alstom compra la eólica Ecotècnia por 350 millones de euros. *Diario de Navarra*, p. 14.

¹²⁸ DDN. (2014, Enero 16). Alstom fabricará en su planta de Buñuel aerogeneradores para Japón. *Diario de Navarra*, p. 34.

In fact, since the purchase of Ecotècnia, Alstom growth in the sector of wind energy was based in the international market, and so the plant of Buñuel, that in 2014 started to produced wind turbines for Japan.¹²⁹

The very same year, 2014, the company makes an agreement with the American firm General Electric for the division of energy. The American firm wanted to enter the European market and buying Alstom was the preferred way to do it.¹³⁰ Nonetheless, the sale was effective one year later, in November 2015.

In January 2016, General Electric presented its reorganization of the business that included the dismissal of 6500 employees in Europe, including the 103 employees in the plant of Buñuel.¹³¹ After several months in negotiations, the plant finally ceased its activity in December 2016, a setback for the wind industry in the region and for the development of La Ribera.

3.2.7. Inmetusa/Aertusa/NOI

Inmetusa, a small family business that started its activity in 1967 in Tudela with the production of naval machinery, industrial turbines and jibs for cruises, begun with the production of wind blades for the international market in 1983, for countries as for Germany, Belgium and the United States. In 1989, the plant started to produce some blades for the national market for the first wind parks in Tarifa, Canarias and La Coruña. In 1995, due to the growing regional wind market, Inmetusa decided to create a subsidiary, Aertusa (Aerodinámica Tudelana SA), jointly with its Dutch associate Aerpac; in order to face the expected increase in the demand for wind blades. Form the period 1983 to 1995 the company produced a total of 1200 wind blades.¹³²

In 2001, the Dutch partner of Aertusa, Aerpac, with the 34% of the shares of the company, announced its bankruptcy. Aertusa had at this moment 58 workers and had recently invested in a new industrial unit for the increasing demand of wind blades and towers.¹³³

¹²⁹ DDN. (2014, Enero 16). Alstom fabricará en su planta de Buñuel aerogeneradores para Japón. Diario de Navarra, p. 34.

¹³⁰ EFE. (2014, Junio 21). El Gobierno francés acepta la oferta de General Electric por Alstom. Diario de Navarra, p. 11.

¹³¹ Manrique, J. (2016, Enero 14). General Electric anuncia el cierre de su planta en Buñuel y el despido de sus 103 empleados. Diario de Navarra, p. 32.

¹³² Vicendoa, M. L. (1999, Mayo 27). Aertusa invertirá 700millones y creará 80 empleos para ampliar su producción eólica. Diario de Navarra, p. 43.

¹³³ I.G. (2001, Marzo 6). Aertusa, de Tudela, busca un nuevo socio tecnológico entre empresas multinacionales. Diario de Navarra, p. 30.

After one year of business talks, Sodena, the financial instrument of the Government of Navarra; jointly with the German multinational firm NOI GmbH, second world leader in the production of wind blades; acquired the company and named it NOI Navarra SA. The distribution of shares remained as follows 7,5% in the hands of the initial investor Inmetusa, 41,5% to Sodena and the remaining 51% to NOI GmbH.¹³⁴ The main clients of the firm were mainly from Navarre, concretely EHN, MTorres and Ecotecnia.

Nevertheless, the new partnership did not last for long. In April 2004, the company made cuts on its workforce of 76 employees. Later in July of the same year, NOI Navarra SA, that at this moment had more than 60 employees; declared its bankruptcy.¹³⁵ The plant was finally sold to Gamesa Eólica for 3.1million euros in March 2005, more concretely to its society Coenasa, Componentes Eólicos de Navarra SA.¹³⁶

Aertusa, the wind subsidiary of Inmetusa, a local family business that started with the adventure of the wind energy with an innovative product before anyone else in the region; was sold to the highest bidder, after more than twenty years in operation in the wind sector; due to the disappointments with its international partners.

3.3. Navarre, cradle of the Spanish renewables' research

In a technological and changing sector as the wind industry the need for creative educated professionals with innovative ideas in the field, is critical to its development. As so it is the support of governmental institutions in the preliminary stages of research. In Navarre, two institutions helped to the development of the wind industry, the National Center of Renewable Energy (CENER) and the National Center of Education of Renewables (CENÍFER).

3.3.1. CENER-CIEMAT

The National Center of Renewables (CENER) was constituted in Navarre through a non-for-profit foundation denominated CENER-CIEMAT established in 2000 by an agreement between the Government of Navarre and the Center of Energetic, Environmental and Technological Investigations (CIEMAT) that depends on the National Ministry of Science and Technology. The center was sponsored at the beginning by five public institutions with the following importance: The Ministry of Science and Technology with an 18%, CIEMAT

¹³⁴ González, I. (2002, Junio 15). La multinacional alemana NOI y Sodena adquieren la empresa tudelana Aertusa. *Diario de Navarra*, p. 42.

¹³⁵ González, I. (2004, Agosto 25). Sodena rechaza comprar NOI Navarra y apuesta por recolocar a los trabajadores. *Diario de Navarra*, p. 27.

¹³⁶ Garde, M., & Manrique, J. (2005, Marzo 16). Gamesa reanudará la actividad en NOI tras comprar sus naves por 3,1 millones. *Diario de Navarra*, p. 35.

with a 27%, the Government of Navarre with a 37%, Cetanasa (the foundation for Technological Centers of Navarre) with a 9% and the Public University of Navarre with the remaining 9%.¹³⁷ The Government of Navarre was the promoter of the initiative that appeared as a referent center of promotion of R&D for renewable energies in the national level, which started with four employees.¹³⁸ As Juan Ormazábal, first general manager of the center, describes in an interview made by *Diario de Navarra* in 2002,¹³⁹ that the center focuses in two main activities research of renewable resources applied to the businesses and the supply of services as for measuring, standardizations and consultancy of renewables energies to the enterprises. The aim of the center is to strengthen and stimulate the sector of renewables with technical and research assistance.

The Government of Navarre disposed a place next to Pamplona, in Sarriguren, for the establishment of the headquarters of the center, where it accomplished the construction of an Innovation City. In 2003, six companies related to renewables acquired the plots of the Innovation City, four of them associated to the wind industry: EHN, Gamesa-Eólica, Ingeteam and Fluitecnik, as we can see in Figure 10. Layout of the Innovation's City in Sarriguren, 2003¹⁴⁰ The Innovation City was a project designed in the Technological Plan of (2000-2003) which aimed for the construction of a new concept of industrial area betting for R&D projects and the future of the region.¹⁴¹

Even though the headquarters, that employed more than 100 people in 2005, 30 of them in the wind branch of knowledge,¹⁴² were not finished until the end 2004, the center started its activity in 2002 with clients as for Gamesa, Endesa, Telefónica, IDAE, EHN, GE Wind, NOI, Eurovento and more.¹⁴³ In 2005, the center worked for more than 200 clients located in Europe, North Africa, Asia and America in its renewable's service areas: wind, solar, biomass, energy in buildings and renewable energy grid integration.¹⁴⁴

¹³⁷ Vicondoa, M. L. (2002, Septiembre 21). Las Obras del Centro de Energías Renovables se inician en noviembre. *Diario de Navarra*, p. 88.

¹³⁸ Vicondoa, M. L. (2003, Diciembre 29). El Centro de Energías Renovables invierte 20 millones en probar aerogeneradores. *Diario de Navarra*, p. 15.

¹³⁹ Vicondoa, M. L. (2002, Junio 2). Entrevista a Juan Ormazábal Jordana, Director General del CENER. *Diario de Navarra*, pp. 4-5.

¹⁴⁰ C.A.M. (2003, Marzo 11). Siete empresas de energías renovables se instalarán en la Ciudad de la innovación. *Diario de Navarra*, p. 40.

¹⁴¹ C.A.M. (2003, Marzo 12). Sanz: <<La Ciudad de la Innovación es una prueba real de desarrollo>>. *Diario de Navarra*, p. 56.

¹⁴² Vocondoa, M. L. (2005, Mayo 22). El Cener, un centro nacional especializado en renovables con más de 100 trabajadores. *Diario de Navarra*, p. 24.

¹⁴³ Salvoch, I. (2003, Marzo 27). El centro de las renovables nace con 15,6 millones de Presupuesto. *Diario de Navarra*, p. 39.

¹⁴⁴ Vocondoa, M. L. (2005, Mayo 22). El Cener, un centro nacional especializado en renovables con más de 100 trabajadores. *Diario de Navarra*, p. 24.

In terms of wind energy, the center was working at the first stages of its activity in the development of systems that allowed the prediction of the wind.¹⁴⁵ In 2004, CENER became part of the international and prestigious organism Measnet (The International Measuring Network of Wind Energy) founded in 1997; which guaranteed the quality of the wind tests in which the foundation was involved in.¹⁴⁶

In 2005, the Wind Turbine Test Laboratory (LEA) project started in Sangüesa, Navarre; complementing the headquarters of CENER in the field of wind energy.¹⁴⁷ Its activity is based in performing tests and trials on wind turbines, ranging from tests on components to tests on complete wind turbines, according to international standards.¹⁴⁸ In 2009, an experimental wind park in the mountain chains of Alaiz was approved for the test in-situ of the wind turbines and blades developed in LEA.¹⁴⁹

Ever since its inception in 2002, the national center of renewable energy, CENER, has invested in research and development projects regional, national and internationally; with a budget of 5million euros annually which is financed in its 75% by R&D contracts for its more than 500 clients.¹⁵⁰ A recent example of the successful functioning of the center is the award in 2015 of the 'Eolo of Innovation' prize granted by the Spanish Business Wind Association (AEE), because of the development of a new system for the union of wind blades jointly with the Navarran firm Investigaciones y Desarrollos Eólicos (Indeol).¹⁵¹

As the center states in their mission, 'The Energy of Knowledge',¹⁵² the sector of renewable energy needs of technical resources and well-prepared people, enriching the region with more than 200 researchers spreading out the Navarran and Spanish brand all over the world.¹⁵³

¹⁴⁵ Salvach, I. (2003, Marzo 27). El centro de las renovables nace con 15,6 millones de Presupuesto. Diario de Navarra, p. 39.

¹⁴⁶ DDN. (2004, Marzo 21). El Cener entra a formar parte del organismo internacional de calidad Measnet. Diario de Navarra, p. 29.

¹⁴⁷ Vicondoa, M. L. (2005, Mayo 22). 42 millones de euros para un laboratorio de palas en Sangüesa. Diario de Navarra, p. 25.

¹⁴⁸ Centro Nacional de Energías Renovables (CENER). (n.d.). Retrieved from <http://www.cener.com/es/>

¹⁴⁹ DN. (2009, Enero 27). Aprobada la puesta en marcha de dos parques experimentales en la sierra de Alaiz y Artajona. Diario de Navarra, p. 24.

¹⁵⁰ Morrás, P. (2008, Setiembre 21). CENTROS TECNOLÓGICOS Constituido por el Centro Nacionalde Energías Renovables, el LEA ayuda a los fabricantes eólicos a testar sus prototipos. Diario de Navarra, p. 4.

¹⁵¹ DN. (2015, Julio 6). Nuevo sistema de palas de Indeol y Cener, premio Eolo Innovación. Diario de Navarra, p. 25.

¹⁵² Centro Nacional de Energías Renovables (CENER). (n.d.). Retrieved from <http://www.cener.com/es/>

¹⁵³ Vicondoa, M. L. (2014, Julio 16). Jofemar y Cener invierten un millón en un proyecto energético. Diario de Navarra, p. 23.

3.3.2. CENÍFER

CENÍFER is the national center for the education of professionals in the sector of renewable energy and energetic efficiency, located in Inmarcoáin, next to Pamplona. The center started its academic activity in 2003 due to the need for professionals formed in the incipient area of renewables.

The center has different modalities of academic training: courses to enterprises, professional training for the employment, in collaboration with the Navarran Service of Employment (SNE); for unemployed people, academic and technical offers to students, advanced courses for professionals' experts in renewables, and academic training offers to international experts. The center has six branches of knowledge, thermal and photovoltaic solar energy; wind energy; hydroelectric energy; regulation, control and industrial communication networks; and academic courses common to all areas. In addition, Cenífer offers since 2006 the prestigious program in Efficient Management of Renewables, pioneer in Spain.¹⁵⁴

Regarding the education in wind energy, the center teaches about wind turbines in terms of development, quality of the electric supply of wind parks, security in the control and maintenance of the parks and about the management of the energy produced.¹⁵⁵ It trains more than 600 students every year in the Professional Training courses offered.¹⁵⁶

Education and people experts in the field of renewables are the future of the industry and centers as Cenífer are crucial for its development. The collaboration among academic institutions and the enterprises, reinforces the empowerment of a sector and it needs to be supported. In Navarre Cenífer and UPNA, the public university of the region, have approached their institutions to the enterprises in renewables and the result has been the development of the industry in the region.

¹⁵⁴ Elizarrri, R. (2006, Mayo 14). Gestionar las energías renovables con eficiencia. Diario de Navarra, p. 16.

¹⁵⁵ CENÍFER. (2017). CENÍFER: Formación en Energías Renovables. Retrieved from <http://www.cenifer.com/wp-content/uploads/2013/12/folleto-institucional-.pdf>

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4. CONCLUSION

The wind industry in Navarre meant the diversification of the region towards a lower dependence on the automotive sector. The advancement of this technology based sector which requires well prepared people and continuous investments in research and development benefitted the region by attracting qualified people and resources. In fact, the industry influenced the education of the region, with the center CENÍFER of renewables and the involvement of the public university, UPNA, with the institutions and enterprises of renewables. Moreover, the incipient development of the wind industry in the region, was determinant for the introduction of the national center of renewables, CENER, in Pamplona; an important step forward for the development of the industry in Navarre, as the cradle of the Spanish renewables' research.

The regional Government was a leading actor during the progress of the wind industry, not only with the acquisition of shares of important companies of the sector, but also with the legislative framework established. The legislation was determinant for the initial expansion of the industry inside the region and also of its succeeding contraction and transition on the road to a wider and more competitive international market. As mentioned before, the influence of the Government of Navarre was crucial for the industry with the implication of SODENA, the financial instrument of the regional government; in the shareholders of essential companies for the wind sector as for EHN and Gamesa Eólica. However, the role of the government was also criticized by both sides, the ones in favor of a free market without public interventions, as MTorres who complained about the treatment of favor given to EHN counter to the competitors; and by the pro-public actors, who objected the sale of the public shares in the sector claiming the missing influence for the progress of the industry within the region.

During the worldwide boom of renewable energy of the 21st century, Navarre continued its advancement as an international referent in the wind industry. Nonetheless, there are two distinct eras for the sector within the region, the prosperous decade from its beginnings in 1994 to 2004; and the freefall stage since 2005, when the wind businesses started to close as for Ecotècnia or were sold to big multinationals as in the case of EHN, Gamesa Eólica and DERSA; and the focus was on the national and international expansion of the businesses. The Government of Navarre played distinct roles throughout the two wind stages of the region: an active role during the prosperous decade with the enacting of favorable laws and energy plans, and public investments in crucial businesses; versus the passive role during the

second era of freefall with the stagnation of the favorable legislation and the progressive sale of the public wind shares.

In spite of Navarre's wind relapse of the last years, the region continues to be an international referent in the topic of wind energy, as an example for the development of a successful industry with the influence regional politics. In fact, Navarre continues to have a vital role in the wind sector with the headquarters of two of the most important companies in the sector, Siemens-Gamesa and Acciona Energía, and the national center of renewables, CENER, located in the capital of the region, Pamplona.

Renewables are the future of the energy, a leading sector where there is still room for improvement. Research and a favorable legislation are fundamental in order to achieve the ideal goal of the total energy consumed in Navarre produced by renewables, all we need is the breeze of 'winds of change'.

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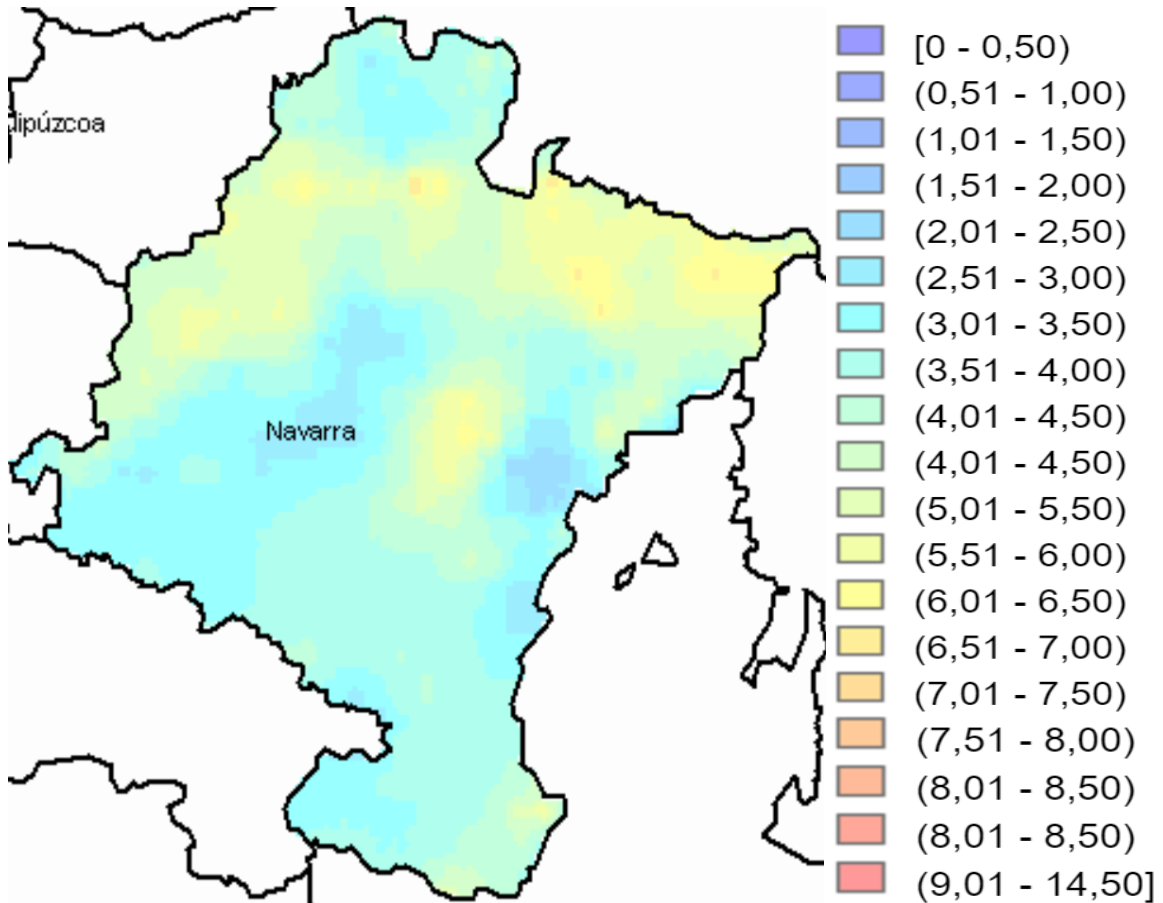
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ANNEX

Figure 8. Wind Map of Navarre



Source: CENER¹⁵⁷

¹⁵⁷ Centro Nacional de Energías Renovables (CENER). (n.d.). GlobalWind Herramienta de Análisis del Potencial Eólico. Retrieved from <http://www.globalwindmap.com/VisorCENER/mapviewer.jsf>

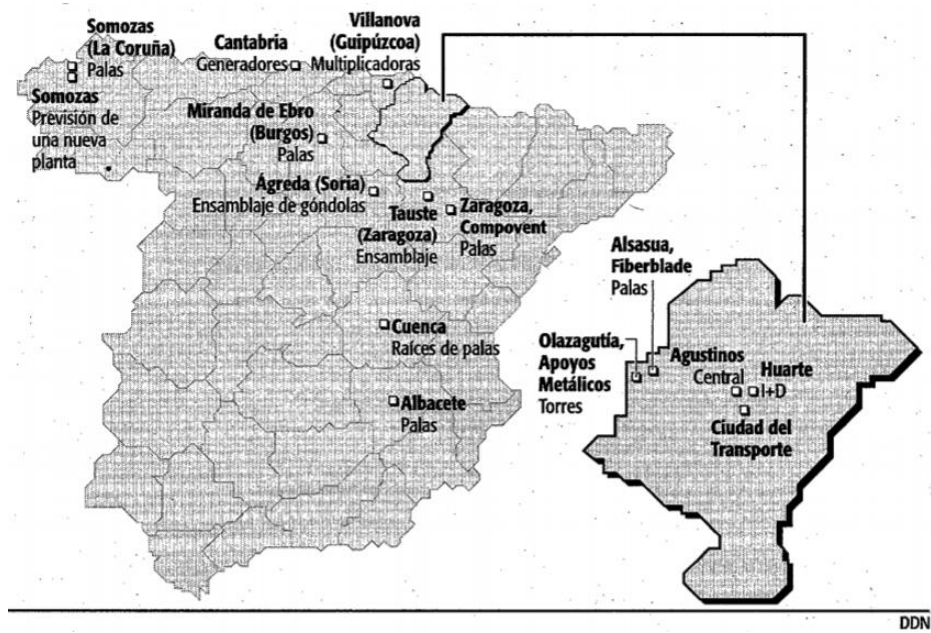
Table 2. Navarre's Wind Firms 2002

Wind Businesses in Navarre 2002			
	Business Denomination	Activity	Municipality
1	AERODINAMICA TUDELA S.A. (NOI Navarra)	Wind Blades	Tudela
2	APROVECHAMIENTOS ENERGÉTICOS DE LA RIBERA	Electrification of remote areas	Tudela
3	APOYOS METALICOS S.A.	Wind Towers	Olazagutia
4	ARRONIZ INGENIERÍA S.L.	Renewable Energies	Pamplona
5	ASESORIA INDUSTRIAL ZABALA, S.A.	Audit, Maintenance, Renewables' Promotion, Technical Assistance Services	Pamplona
6	CENER	R&D of Renewables	Pamplona
7	CONSTRUCCIONES AZPIROZ Y SARALEGUI	Installation of Wind-Parks	Lekunberri
8	DESARROLLO DE ENERGÍAS RENOVABLES SA	Installation of Wind-Parks	Pamplona
9	ECOTECNIA NAVARRA SA	Assembly of Wind-Turbines	Pamplona
10	ELECINOR	Electric Installations	Pamplona
11	ENDAKI 2 SL	General Machinery	Lekunberri
12	ENERGIA HIDROELECTRICA DE NAVARRA SA	Promotion, Construction and Exploitation of electric facilities with renewable energy	Pamplona
13	EOLICA CABANILLAS SL	Electricity Generation with Renewable Energy	Buñuel
14	EOLICA CAPARROSO SL	Electricity Generation with Renewable Energy	Buñuel
15	EOLICA LA BANDERA SL	Electricity Generation with Renewable Energy	Buñuel
16	EOLICA MONTES DE CIERZO SL	Electricity Generation with Renewable Energy	Buñuel
17	EOLICA NAVARRA SL	Electricity Generation with Renewable Energy	Buñuel
18	FIBERBLADE S.A.	Wind Blades	Alsasua
19	GAMESA EOLICA SA	Development and Production of Wind Turbines	Pamplona
20	GAPI	Maintenance of Windmills	Tafalla
21	HORMIGONES Y BIENES DE EQUIPO S.A.L.	Wind Towers	Alsasua
22	INCA INGENIERÍA E INSTALACIONES, S.L.L.	Projects, Installations of Equipment, Maintenance, Promotion of Renewable Energy, Technical Assistance Services	Tudela
23	INDUSTRIAL BARRANQUESA, S.A.	Clamps for Windmills	Lacunza
24	INGETEM SA	Distribution and Production of Energy	Pamplona
25	INGETUR	Wind Turbines	Barásoain
26	LEVENGER	Environmental Energy, Consultancy, Management, Supply and Engineering	Larraun
27	LINEA SOLAR S.L.	Audit, Projects, Intstallment of Equipment, Maintenance, Production o Equipment, Promotion of Energy	Corella
28	M TORRES DISEÑOS INDUSTRIALES SA	Development and Production of Wind Turbines	Torres
29	MULTISERVICIOS ENERG. I. C.	Projects and Consulting Services for Alternative Energies	Ayegui
30	POLIESTER MAM	Production of diverse material with plastic (windmill cabin)	Sangüesa
31	SAGOKI SOLAR NAVARRA	Projects, Installations and Consulting of Wind and Solar Energy	Burlada
32	SAKANA SCI	Steel Smelting	Lacunza
33	SECTROL	Assembly of Wind-Turbines	Pamplona
34	TALLERES MICROMECHANIC S A	Mechanized Equipment and Disc Brakes for Windmils	Oricáin
35	TREÓLICA (division of FLUTECNIK)	Automation of Industrial Processes and Systems for the Generation of Wind Energy	Orcóyen

Source: Own elaboration with data from Servicio Navarro de Empleo¹⁵⁸

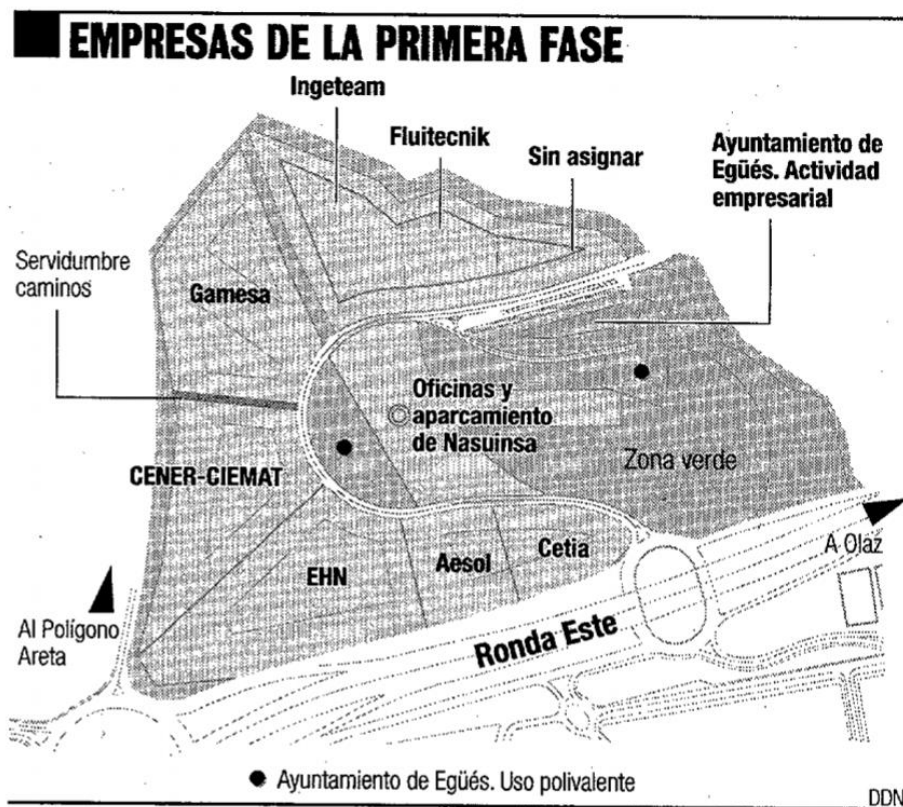
¹⁵⁸ Pintor Borobia, J., García Ortega, J., Faulín Fajardo, J., & Lera López, F. (2002). Situación actual y prospectiva de futuro del sector de las energías renovables en Navarra.

Figure 9. Layout of Gamesa Eólica Spanish plants in 2003



Source: *Diario de Navarra*¹⁵⁹

Figure 10. Layout of the Innovation's City in Sarriguren, 2003



Source: *Diario de Navarra*¹⁶⁰

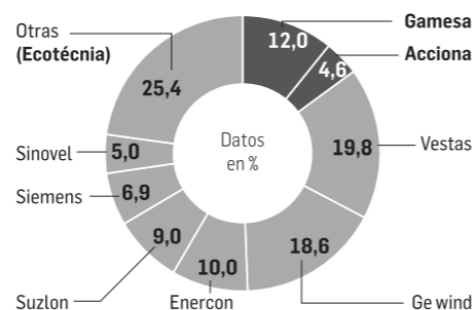
¹⁵⁹ Vicondoa, M. L. (2003, Septiembre 28). Gamesa Eólica busca fuera el viento. *Diario de Navarra*, pp. 2-3.

¹⁶⁰ C.A.M. (2003, Marzo 11). Siete empresas de energías renovables se instalarán en la Ciudad de la innovación. *Diario de Navarra*, p. 40.

Figure 11. Market Share of Wind Turbines 2008

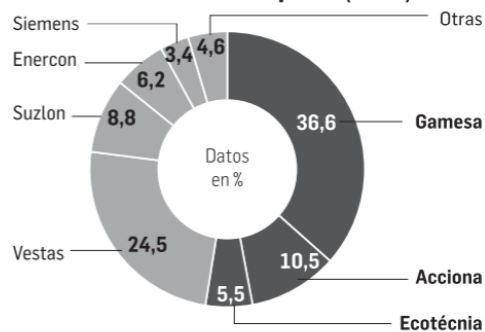
Cuotas de mercado de empresas de energía eólica

■ Cuotas de mercado mundial (2008)



Fuente:
BTM
Consult APS

■ Cuotas de mercado español (2008)



DN

Source: Diario de Navarra¹⁶¹

Figure 12. DERSA's Wind Parks in 2005

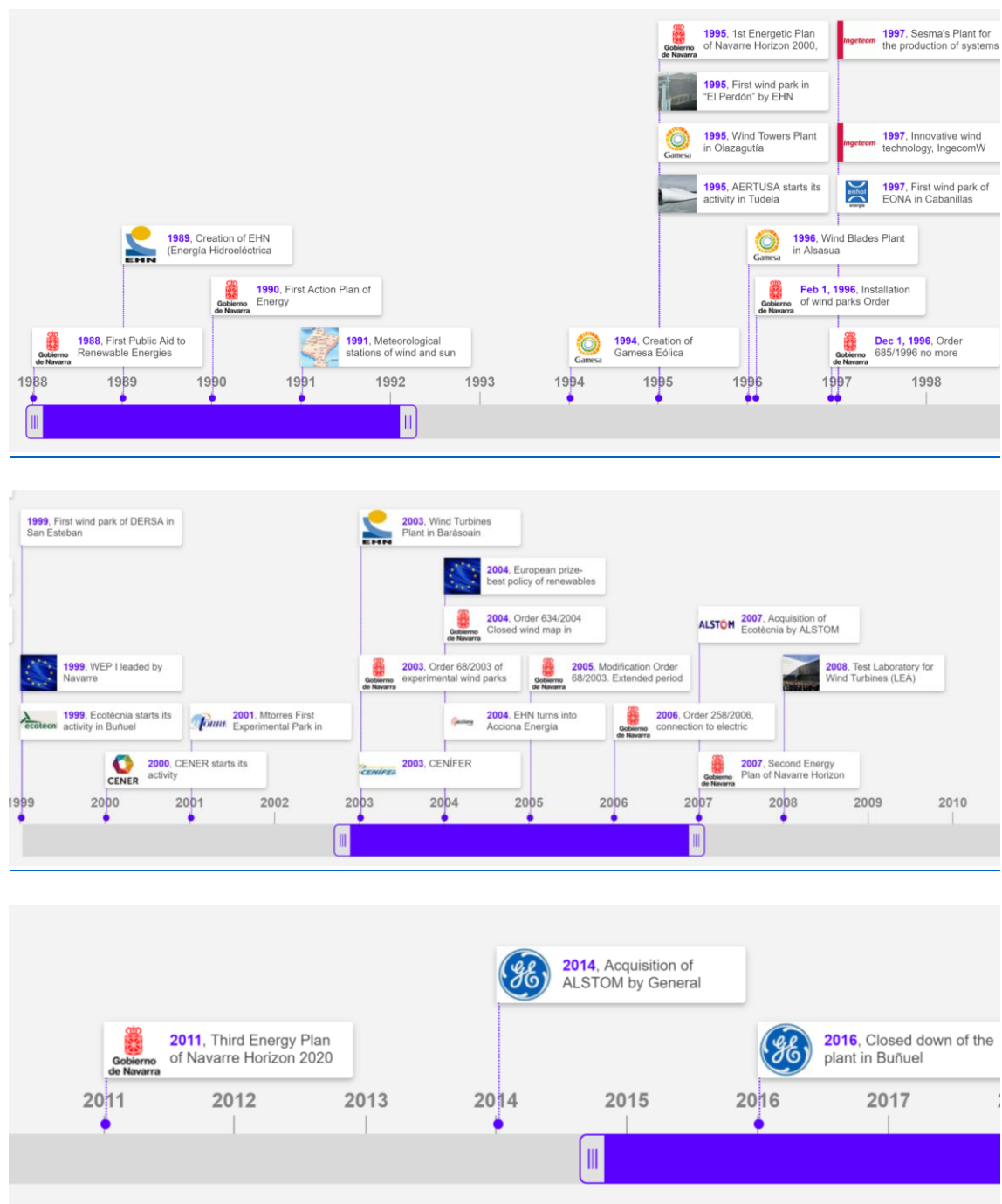
Parques eólicos en explotación			Fuente: Dersa		
Provincia	Sociedad participada	Parque	Puesta en marcha	Nº de aerogeneradores	KW total Potencia
Navarra	Derna (50%)	San Esteban	1999	37	24,420
		Caluengo	2001	33	49,500
		Uzquita	2004	29	24,650
		San Esteban II	2004	13	11,050
		San Esteban Olcoz	Construcción	8	16,000
La Rioja	DERioja (36,25%)	Cabimenteros	2000	75	49,500
		Escurreillo	2002	33	49,500
	Molinos Cidacos (50%)	Gatun	2002	33	49,500
		Gatun II	2003	11	16,500
		Munilla	Construcción	18	36,000
Aragón	Molinos de La Rioja (33,33%)	Larriba	Construcción	16	32,000
		Prejano	Construcción	35	29,750
		La Muela (20,00%)	1996	35	21,000
Castilla y León	Mas Garujo (18,00%)	La Plana III	1998	25	16,500
		Mas Garujo	1998	25	16,500
	Boreas (99,52%)	Montija	2004	28	30,800
Castilla La Mancha	Boreas 2 (90,00%)	La Sia	2004	27	29,700
		Montejo	Construcción	16	13,600
		Los Castrios (33,33%)	Construcción	24	26,400
Cantabria	DERSA CLMancha (100,00%)	Los Castrios	Construcción	33	49,500
		Canredondo	Construcción	-	25,000
		Somballe	Construcción	-	15,000
	Boreas	Lantueno	Construcción	-	15,000
		Zalama	Construcción	-	22,500

Source: Diario de Navarra¹⁶²

¹⁶¹ Salvoch, Í. (2009, Julio 7). Tres empresas navarras implantaron el 16% de la potencia eólica mundial en 2008. Diario de Navarra, p. 14.

¹⁶² P.M./Agencias. (2005, Abril 21). Gas Natural compra la empresa eólica Gas Natural compra la empresa eólica. Diario de Navarra, p. 36.

Figure 13. Timeline of the Wind Industry in Navarre



Source: Own elaboration